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D. M. Campbell, Editor A. T. Kinsley, Associate Editor

A Special Issue on Swine Practice

IT HAS been a decade since the latest and best work on diseases of swine was written. This ten-year period has been fruitful in the accumulation of information concerning the diseases and treatment of swine. Ten years ago there was much less information available concerning the enteric diseases of swine than is available now. Such diseases were generally grouped at that time as "mixed infection." Their prophylaxis was not understood and their treatment was largely empiric.

At that time, it was believed that swine erysipelas did not occur in this country and "diamond skin diseases" was looked upon as a benign affection. Hog cholera was still believed in many quarters, to be the all important disease of swine, and the virus used for the simultaneous treatment was not standardized to the extent that it is now.

Abortion in swine received little or no attention and vulvovaginitis of swine and edema or infectious edema of the lungs of swine had not been heard of ten years ago. The McLean County system for combating filth borne diseases and parasitisms in pigs had not been worked out.

Farmer vaccination for the prevention of hog cholera was not a menace to the swine owner or a costly procedure to the veterinarian to anything like the extent that it has since become. The emasculatome had not been introduced and the Benesch anesthesia was unknown in this country a decade ago.

To make readily available for veterinarians the latest information on all the foregoing and even more, to make available the progress that has been made in the treatment of other infectious diseases and parasitisms of swine, it seemed desirable to devote one issue of VETERINARY MEDICINE exclusively to subjects concerned with swine practice and to bring together in a systematic way, the latest information on these subjects as a supplement not only to the very excellent texts now available on swine diseases, but as a compilation and ready reference for the practitioner who has in his own experience, a store of information on swine practice upon which to draw.

Of course, in the discussion of a subject as broad as diseases of swine, no complete or comprehensive treatise of any division of the subject can be given in a single issue of VETERINARY MEDICINE, but we believe writers of the articles in this issue have included the essential new developments in the diagnosis, treatment and prevention of diseases of swine, comprehensive enough to be of great value to the experienced practitioner, and explicit enough to serve as a valuable guide for the less experienced.

Herd Management of Swine

By H. M. MENEOUGH, Kansas City, Missouri
Fieldman The Poland China Journal

IN founding or establishing a herd of hogs, one definite decision must be made at the outset and that is the ultimate market for your product.

While the production of market hogs and purebreds for the breeder trade are quite closely correlated as far as foundation animals, feed, care and equipment are concerned, there is still enough difference in the ultimate use of the animals that the logical thing to do is to decide what market you will cater to and then plan accordingly.

In founding a herd our first thought would naturally be the amount and nature of equipment for the proposed herd. In establishing a herd we have to bear in mind the approximate amount of feed and forage necessary to produce a crop of hogs and whether we are going to grow all the grains fed the herd or whether we are planning on buying a percentage of or all of our feeds.

If we are planning a herd to utilize just the grain grown on the farm, then it naturally follows that the size of the herd will be regulated by the number of acres in the farm and the yield of grains from those acres.

There are so many factors that would enter into the size of the herd if it were governed by the number of acres of crops that it is possible in only a very general way to estimate the ratio of hogs to acres. Cheapness of production would demand that we keep the numbers small enough at all times so that we would have ample pasture and forage. Ample forage and water are the two chief elements that tend toward economical pork production. Grain crops are so dependent on the kinds and yields and are subject to weather and seasonal conditions that I would hesitate to hazard a guess on the ratio of animals to acres, but possibly two animals per acre would utilize most of the grain and give ample forage.

Equipment should consist of a main farrowing house which may be of the permanent type or one of the movable variety that are offered now by several manufacturing concerns. These houses contain six pens and a stove for heat during cold weather when pigs are young and easily chilled. The movable houses have the advantage that they can be moved to new lots or fields and eliminate much source of infections and contagious diseases.

Permanent farrowing houses should be built with floors that can be washed and cleaned before each farrowing season. This washing and cleaning would also apply to partitions, and must be thorough. Lye and boiling water or steam are recommended for the most thorough methods. Other equipment would include troughs of convenient sizes and preferably of metal. They have to be kept clean and sanitary, and that is more easily and readily done with metal troughs.

Individual houses placed in the pastures are one of the most necessary pieces of equipment for the modern hog farm. Our most satisfactory method of handling young pigs at this time is to thoroughly clean the farrowing house and carefully wash the sow that is to farrow and place her in a pen in the house as soon as she is clean and keep her there until after she farrows and the pigs are about ten days old. Then move the family to an individual house in a clean, new pasture and grow the litter there. A number of sows may have the run of the same pasture with a litter, but each sow should have her own private house and be required to keep that house and not allowed to mix with other sows and litters for sleeping quarters.

Sows should be allowed to nurse their litters for eight weeks, when the pigs will have developed good appetites and be using quite a lot of feed on their own account. When pigs are eight weeks old the sows may be taken away and fattened for market, or rebred for the next crop of pigs if the owner

is raising two crops of pigs per year. Every sow properly fed should raise two good litters of pigs per year. The spring crop should arrive early in March so that the pigs may be weaned and the sows rebred early in May for litters the fore part of September, that they may have the advantage of the warm fall weather and be well started in growth before the winter sets in.

Getting back to the foundation animals themselves: Whether we are producing market pork or breeding animals, the obvious animal to start with is the purebred. I would suggest that the owner select the breed he prefers and then purchase representative animals of that breed from any reputable breeder. If you are producing market pork, you should lay special emphasis on prolificacy and feeding ability and possibly be less critical of type and show ring possibilities. Also your initial outlay will not be as great per head in production for the market as for the breeder trade, but on the same basis you do not expect the same return that you would in producing the high class breeding animal.

High class, purebred, sires should be used at all times and will more than pay their way regardless of the market you are catering to. Good sows are retained in the herd for years in breeding for the breeder trade, but market production follows two general habits. Gilts are used to farrow the spring crop and are then fattened and marketed or rebred and then marketed after the raising of the fall litter, or maybe kept over for the next season. If they are to be marketed after the first year, the breeder should select, at about four months of age, his best gilts from his largest litters raised, and develop them, not fatten them, so that they may be mated in November for his next spring crop of pigs.

Now about the feeds. Certainly the greatest factor governing the profit in any livestock enterprise after the purchase of foundation animals and excepting disease and its treatment, is the feeds and feeding. It's the biggest study the modern layman has and it is too often neglected and at a great price for that neglect. It is too big a problem to treat in more than a general way here, but there are some of the simpler methods and feeds that can be fairly well covered.

Prior to the breeding season the future herd sows should be fed a growing and fairly laxative ration of the ordinary farm grains, but not enough corn to fatten them, and they should not be fat when bred. They should be thrifty and gaining, but not fattening.

I would recommend plenty of range and a slop of mill feeds or ground barley or oats, supplemented with oil meal and tankage. I would prefer at least part of that protein supplement to be oil meal as we get a more laxative ration that way. Enough corn can be added to keep the animals in good condition, but not fat. That same ration would carry the sows through the winter, but more corn should be added during the cold weather and to put on a bit more fat by the time the sow will farrow. She should have at all times access to any good mineral mixture and plenty of opportunity for exercise. The more the better. All pigs of any age should have access to fresh water and minerals.

At farrowing time, discontinue the corn and feed the same slop but add enough mineral to it to keep the droppings soft. That will eliminate the bulk of farrowing trouble. After a sow farrows she should be fed to produce milk, as the pigs need it, and there isn't any set rule to follow; some sows need heavy feeding within a day or two after farrowing to stimulate milk flow and other sows won't need a full feed for several days. It's just up to the caretaker to watch his sows and use judgment in feeding. Be sure your sow needs feed before you give it to her, as too much milk means caked udders and plenty of trouble. On the other hand, don't let the pigs starve because your sow needs feed. Proper feed and care will get the sow and litter out of the farrowing house and into the individual houses where they will again have the advantage of pasture and range and exercise.

The sows are now fed all they will eat and the more you can get them to eat the better the litter is going to do. We don't have any feeds that compare with milk, and

the more feed your sows consume the faster the litters will gain. What gains they make while nursing the sows are the cheapest gains they will ever make, and that gain once made doesn't have to be made again.

When the pigs are about four weeks old they will begin to need and want a feed supplementary to the mother's milk. Tankage, ground corn, oil meal and oat meal fed free style in self-feeders are all valuable and satisfactory feeds, as are most of the pig meals now on the market. These feeds can be either mixed in a slop or fed in self-feeders, and results will be fully as satisfactory if a creep is built where the young pigs can get in and the sows can't and access is given to the above feeds dry in a self-feeder. Continue the heavy slopping of the sows until the pigs are old enough to wean.

After the pigs are weaned and the sow taken to a separate lot, begins the chief difference in the methods of handling for market or for breeding purposes. If the pigs are to be marketed they may continue on the self-feeder and the ration might be confined to corn and tankage or corn and tankage and oil meal.

If this method is followed don't forget to provide forage, minerals and fresh water at all times for best results. Also don't neglect to separate whatever gilts you will need for your next year's sows before they start to fatten and carry them on a ration that won't fatten them. Fattened animals don't mature as they should and do not make satisfactory breeding animals.

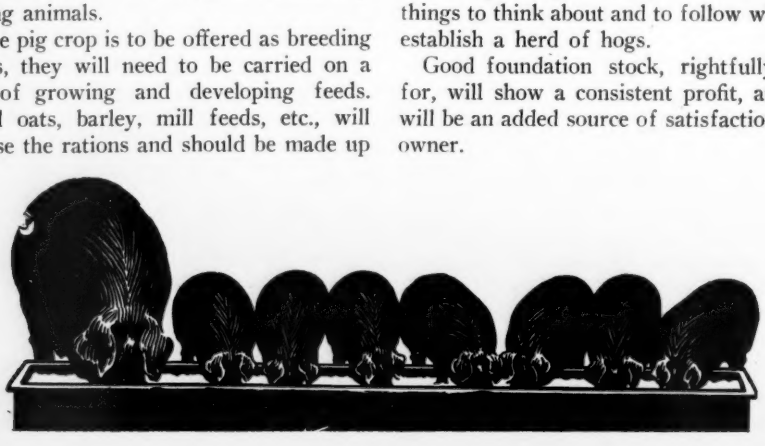
If the pig crop is to be offered as breeding animals, they will need to be carried on a ration of growing and developing feeds. Ground oats, barley, mill feeds, etc., will comprise the rations and should be made up from what can be procured the cheapest and then supplemented with oil meal and tankage to get the protein needed. Any good pig meal will also prove satisfactory if it can be fed as cheaply. Boars and gilts should be separated at about four months of age and developed on about the same ration. Boars may require a bit more corn.

One factor that we haven't discussed in pork production is sanitation for prevention of diseases and treatment of them should occasion arise. There is obviously only one place to turn for this information and that is to your local graduate veterinarian. The livestock men of America owe a debt to the veterinarian that they will never be able to repay. There wouldn't be any livestock industry if it weren't for the science, research, effort and vigilance of the veterinary profession. Our herds would have been wiped out by foot-and-mouth disease, cholera, glanders, etc., that only the veterinarians have combatted and controlled.

Have your veterinarian vaccinate your herd with a reputable serum and virus, and if an animal shows symptoms of disease, call a veterinarian. He will recognize it and treat it and cure it. Don't neglect disease and don't feed or use some concoction sold or advised by some quack or dope vender who doesn't know what he is talking about and may ruin a bunch of pigs for you. Use your veterinarian. He is trained and competent.

This partially covers the fundamental things to think about and to follow when you establish a herd of hogs.

Good foundation stock, rightfully cared for, will show a consistent profit, and they will be an added source of satisfaction to the owner.



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Collecting and Shipping Specimens for Laboratory Examination

By J. D. RAY, Kansas City, Missouri

SWINE problems are on the increase. It is practically impossible to differentiate clinically between some of the bacterial infections that are common today. Use the reputable diagnostic laboratories available.

The preparation of specimens for laboratory diagnosis is a very important part of the practitioners' daily routine. The extent and reliability of a diagnosis depends on the condition of specimens received at the laboratory so a few suggestions are offered.

Specimens submitted may be (1) live animals; (2) carcasses; (3) selected specimens from autopsy, or (4) blood specimens.

When possible to submit characteristic diseased animals, they make the most satisfactory specimens for laboratory diagnosis. Both symptoms and lesions can then be observed. The carcass of an animal should not be shipped except in cold weather or when properly iced. Selected specimens from autopsies held in the field are the ones most commonly submitted for a laboratory examination. Such specimens are best collected from animals that have been dead only a few minutes if collected in warm weather, or one that is killed while in the last stages of the disease. Include any tissue showing well marked lesions. It is well to include the entire lungs and heart, spleen, kidneys, some bone, several glands, section of bowel showing lesions and a portion of any other abnormal tissue. Avoid cutting into specimens as much as possible.

Frequently, such specimens are collected on the farm without knowing beforehand what was to be done. In such cases procure ample newspapers and wrap specimens separately to absorb moisture. These should be taken to office, removed from the papers and packed in sufficient borax to absorb all juices. If borax is placed between all folds and in cuts, etc., they will usually be well preserved when received at the laboratory. Sections of intestine are best opened, washed and blotted dry with absorbent cotton before packing in the borax. Always avoid placing intestine and other tissues in too close proximity in packages —never mix them in containers unless borax or some other material keeps them apart. Fruit jars and buckets that can be sealed are usually convenient. Such containers should be packed in well protected cartons and shipped by express, marked perishable or by special delivery mail. Such shipments receive special care and attention.

If practical, all such specimens packed as described should be iced in hot weather. If long shipments are made and specimens are of special importance, always ice them. Bear in mind when icing specimens that it is imperative that the ice and water from melting ice do not contact the specimens directly. If specimens are in glass jars, seal them tightly with rubbers and place in a bucket to protect from breaking by the ice. Place this bucket in a large can or bucket that will hold ice. Such shipments can be re-iced, in transit. If care is exercised in selecting specimens, and they will not be in transit but a few hours, they may be placed in containers and iced and promptly forwarded in good condition without the use of borax. It is useless to ship tissue specimens in hot weather unless precautionary measures are taken. They will not arrive at their destination in a condition that will convey the desired information.

Never ship specimens from rabies suspects unless labelled as such.

When a head is forwarded it is very important that it be properly iced. Frequently such specimens are received in warm weather without ice and the entire brain has decomposed, liquefied, and run out, leaving nothing for examination.

Blood samples are best collected in small sterile vials or bottles with tight stoppers of some kind. It is imperative that containers be dry, a few drops of water may cause extensive hemolosis and mar tests. Label such specimens and ship as soon as a firm clot forms. The serum will usually be separated from the clot and ready for use on arrival at the laboratory.

Specimens of blood from living or dead animals are very unsatisfactory for cultural work. Blood cultures are best made from vessels in heart wall or center of large clots. Slides made in the field are practically worthless in swine diagnosis.

When you send specimens always write and give as much information as possible about the condition in question.

History, Physical Examination and Diagnosis in Swine Practice

By J. S. KOEN, Bloomington, Illinois

IT GRIEVES me to hear graduate veterinarians say they are unable to make a diagnosis of swine diseases. Upon a veterinarian's ability to correctly diagnose a disease depends his ability to successfully treat the patient. It is a mark of distinction, training, and scientific skill to be able to do so. Every graduate veterinarian should aspire to at least a reasonable degree of efficiency in this respect and be very slow to admit any such deficiency as an inability to diagnose the diseases of swine.

About the only qualification left the veterinarian by some of our "quack competitors" (farmer vaccinators and pseudo-farm advisors) is that his special training *should* make him competent to diagnose diseases of live stock and with some degree of proficiency differentiate one disease from another. Our ability to render this service together with a superior technic in the administration of treatment to swine are the surest means of redeeming swine practice for the profession and taking it out of the hands of the laity.

It sometimes happens in examining a herd of swine that sufficient evidence is not available, or that complications are too numerous, to make a definite diagnosis possible. In the vast majority of cases, however, sufficient evidence will be found to warrant a diagnosis. Veterinarians should be able to analyze the situation and I believe in most instances they are. The veterinary profession has successfully eradicated, controlled, or is rapidly bringing under control and eradication, every disease of animals the live stock industry or public welfare has called upon it to combat *with the single exception of hog cholera.* And veterinarians had hog cholera under control until organized efforts were started to take the vaccination of swine from them and turn it over to untrained laymen. Such a procedure foredoomed the swine industry to the disastrous outbreak of 1926 which resulted in the heaviest loss in the history of the industry.

Notwithstanding all this opposition, greater progress has been made in swine practice, and in a shorter space of time, than in any other phase of veterinary practice. Truly we can "point with pride" to the achievements of the profession in swine practice.

Three factors enter into consideration in attempting to make a diagnosis, viz., history, symptoms, and post-mortem lesions. Some cases may be diagnosed on history alone; others may present clinical symptoms that signify certain diseases; but post-mortem

lesions are often necessary to confirm what the history and symptoms indicate. One is seldom safe in sitting on the fence and making a positive diagnosis of hog cholera.

There follows an outline that has proved helpful to the writer in field investigations covering an experience of several years.

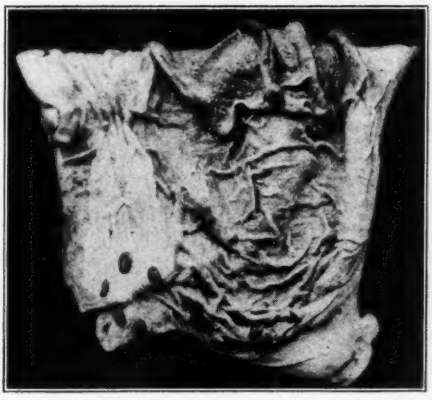
Cholera. This is a herd disease. It comes on rather gradually. One or more get sick first after which it may spread through the herd rapidly. Refusal to eat will be the first symptom noted. The appetite is in almost if not complete abeyance. The sick ones lay in the nest when the herd is called for feed, or come out very slowly with heads down as though thinking it over. A thinking hog is a sick hog. The temperature is 104 to 106 deg. F., or higher. There is congestion of visible mucosa; matting of eyes, gaunt, hollow, tuckedup flank; arched back; respiration about normal and constipation followed by diarrhea with rapid weakening and auto-intoxication indicating drunkenness rather than weakness—a staggering gait. The progress of disease is slow at first, rapid later. Younger pigs are usually attacked first, but animals of any age may be attacked. One attack usually confers life immunity.

The herd is not immune. If it is a susceptible herd, think of cholera first and all the time until it has been definitely eliminated. Careful questioning usually reveals a history of exposure of some sort.

Flu. A herd disease attacking both immune and non-immune hogs. The onset is sudden and severe. It attacks the whole herd in from 24 to 48 hours. The hogs are very sick and distressed, showing a pronounced and peculiar dyspnea and thumping, with a heavy painful cough when stirred from the nest. There is muscular soreness and the animals are nervous and excitable. There is a congestion of eyes, with watery discharge from eyes and nose but the eyes do not gum or mat as in cholera. The temperatures may be very high, often 108 deg. F. There is rapid loss of flesh—the animals may lose in weight as much as five pounds daily. There is extreme physical weakness and a very rapid progress through herd. Flu usually lasts four to seven days and the patients begin to recover about the time death is expected. One attack does not confer immunity against subsequent attacks.

Necrotic Enteritis. This is not a herd disease although the entire herd may become affected if sick and well hogs are left together. Persistent diarrhea with characteristic odor is a prominent symptom. The appetite is but slightly impaired, but little benefit is derived from food. There is progressive emaciation and the patient seems to "dry up," yet remains active and comparatively strong on its feet. The visible mucosa are normal or anemic. There is skin scurvy. The temperature is usually lower than in cholera but may reach 106 deg. F. and the disease progresses slowly through herd.

Swine Plague or Hemorrhagic Septicemia. As a primary disease hemorrhagic septicemia is rarely encountered in swine. As a complication of hog cholera it is frequently seen. It is not a herd disease. A few or several may be affected suddenly. The herd may appear all right at night and dead hogs be found in it the next morning. Usually those affected show difficulty in breathing, and cough. The appetite is impaired but they still eat. There is little bowel disturbance noted; little or no congestion of visible mucosa, and the temperatures rise more slowly and do not go as high as in cholera. Intermittent attacks may occur in same herd.



Stomach of a hog showing bots (Gastrophilus intestinalis, attached to the mucosa.

Swine Sanitation Prevents and Controls Parasites in Swine

H. B. RAFFENSPERGER, Miles City, Montana
Zoological Division, Bureau of Animal Industry,
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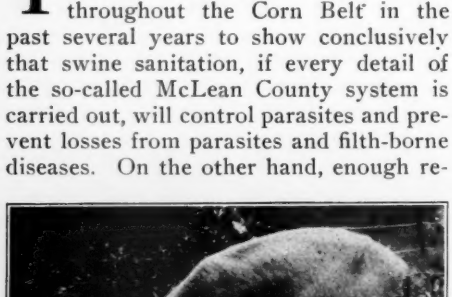
THERE has been enough of research and of practical demonstration throughout the Corn Belt in the past several years to show conclusively that swine sanitation, if every detail of the so-called McLean County system is carried out, will control parasites and prevent losses from parasites and filth-borne diseases. On the other hand, enough research has been done and enough records have been kept to show conclusively that following the old practice of swine production along the lines of harboring pigs around old hog lots year after year has caused a tremendous loss of young pigs from filth-borne and parasitic diseases. The old system of keeping the pigs in a hog lot close to the central hog house, so that the pigs are easily accessible for feeding and watering, has proved to be very costly.



A typical example of the effect of ascaris infestation of pigs. At four months of age badly infested pigs frequently weigh less than half as much as non-infested pigs of the same age, on the same kind of feed. Such pigs represent a loss to the swine raiser just as surely as pigs that die of hog cholera.

In the dirty-hog-lot method of raising pigs, it has always been necessary to use various treatments to keep the pigs free from parasites, and in connection with the use of various drugs which are ineffective the effort has proved to be rather futile and costly in many cases. We have in oil of chenopodium an effective drug for removing ascarids from swine, and when swine are heavily infested with ascarids it is profitable to treat them with chenopodium, since sanitation is a preventive measure and not a curative measure. There are certain species of parasite that cannot be successfully destroyed by drugs. Thus, there is no treatment at the present time that has proved to be efficient for lung worms in swine, and the losses from these parasites in young pigs are considerable. The treatment of thorn-head infestation has not been successfully worked out at the present time, and there is no treatment for kidney worms. Kidney worms are responsible, in certain sections of this country, for heavy losses, not only in the way of the pigs not making adequate gains, but also at slaughtering time in heavy losses from the invasion by these parasites of the liver and the fat around the kidneys, as well as of the kidneys and loins.

It is readily seen that where treatment is not applicable, as in these cases, some means of prevention must be employed. Even in such cases as that of ascarids or roundworms in swine, for which we have a good treatment, prevention is better than treatment. Ascarids appear to be by far the most common, or at least the most commonly injurious, of all internal parasites of swine in this country. Much of the injury done by these parasites is done in the early stages of their life

cycle in the host, especially by the larvae in the liver and lungs. It has been found that multiple abscesses of the lungs of young pigs will sometimes follow the injury caused by the ascarid larvae and in such cases there is no treatment for this condition. This condition is one of several causes of unthrifty pigs.

Before treating swine for worms, we should first ascertain that there is a parasitic infestation in the animals to be treated and what species of parasites are present and then dose individually with suitable drugs. The animals treated should be held in a small inclosure and the parasites and fecal material passed during the following two days should be gathered up daily and buried or burned, as otherwise the female parasites and ova from the feces which have been passed as a result of the treatment may cause a heavy infection in a localized area. Finally, one should advise the swine grower to avoid future trouble from ascarids by the use of the swine sanitation system commonly called the McLean County system. The results in treating pigs for roundworms are sometimes disappointing. The pigs do not make the gains which would be expected after the treatment. In such cases the explanation may be that the injury from the larval invasion is still persisting, or that disease conditions, other than those due to parasites, are present.

Go through the Corn Belt, visit the live stock men, observe those that follow the practice of harboring their pigs around the permanent hog lot and you will observe heavy losses in pigs, not only from parasites but from filth-borne diseases. Then observe those who are following a definite system of sanitation, placing in a clean farrowing pen sows which are free from filth on the outside of their bodies, then taking the sows and little pigs soon after farrowing to a clean legume pasture, and holding them there for four or five months before they are brought to the feed lot, and you will see droves of thrifty pigs which have sustained few losses, and which will feed out for market four to six weeks sooner than pigs exposed to infection in insanitary quarters during their early life.

Much work of a constructive character for the control of parasites by sanitation has been done by the U. S. Bureau of Animal Industry and it will pay the veterinary profession to make use of these preventive measures and help educate the swine producers of this country to build up a profitable swine industry and enable the swine grower to employ a veterinarian to look after valuable and profitable animals.

This is an age of preventive medicine and if we can keep disease from our flocks and herds we shall accomplish much more than we may ever expect to accomplish by curing an animal of a serious disease condition, no matter how efficient the treatment. This statement applies especially to the prevention and control of parasitic disease in swine by strict sanitation. Sick animals must be treated if possible, since preventive measures are rarely curative, but the prevention of sickness is the logical—the desirable thing.

Pigs in different stages of tetanus. The mud hole shown at the left is the probable source of the infection.

Medication of Swine

By M. E. GOUGE, Sedalia, Missouri

SWINE practice is in the main herd practice. When it is necessary to administer drugs or biologics to swine, it is usually necessary to administer to many animals of low individual value. This, in itself, necessitates a modification of the methods used in horse or cattle practice. The intractable disposition of the hog, the difficulty attending the administration of capsules or drenches and the facility with which this animal gets rid of irritant drugs through emesis further complicates the problem of giving it medicine.

The administration of medicine *per os* to swine that are too sick to eat is generally unsatisfactory. Such ministration seldom does much good and in my hands it has frequently done harm. Hypodermic medication on the other hand is usually satisfactory and I resort to it wherever possible. Each year at the State Fair I have many cases in which I use hypodermic medication with good results. Of course, these are animals of unusual value and the owner is justified in going to the expense entailed in individual treatment for his hogs. Except for high-priced animals, I almost never undertake the treatment of a hog that is too sick to eat. If a herd is involved and hypodermic medication can be given, all right, otherwise the results seldom justify the expense.

Probably 95 per cent of all medicine administered to swine *per os* is given to combat internal parasites. Such anthelmintics are usually given either as a liquid or in capsules. Formerly, when santonin was not prohibitive in price, its administration in capsules was fairly satisfactory, but this is not true of oil of chenopodium. The irritant properties of this drug render giving it in capsules somewhat hazardous when administered by a veterinarian, and entirely too dangerous where given by the swine owner.

There is always danger that a capsule may lodge in the pockets at the side of the pharynx and when chenopodium is used, this results in great swelling of the throat and frequently in death. A short time ago a client of mine administered worm capsules to 120 head of shotes. He reported the next day that 35 were dead and the throats of 40 more were so swollen they could hardly breathe. I have not learned the outcome. Luckily I did not sell him the capsules.

Again, capsules are often coughed up and their effect lost. When swallowed the contents are frequently vomited as soon as the capsule dissolves and the irritant chenopodium comes in contact with the stomach.

If oil of chenopodium or any other of the irritant vermifuges are to be used, the liquid form with a castor oil base is the only treatment that will be satisfactory. This can be administered in three ways—with the stomach tube, with the dose syringe, and in the feed.

The stomach tube gives good results, but it requires a skilled operator. It is too slow and laborious for me. Administering with a dose syringe is a noisy, tiresome task, and one cannot depend upon getting more than half of the medicament swallowed. The third method, giving it in slop or thin, liquid feed, is by far the most satisfactory.

By starving the pigs 24 to 36 hours and then adding the medicine to thin, liquid feed or slop, the hogs will usually drink it if it has been properly prepared. By this method, the right quantity of medicine is administered to each pig. The slop should be prepared for a small number of pigs at a time. Every drop of the medicine is carried into the stomach in a diluted form. There is no vomiting and digestion, starting immediately, carries the medicament into the intestines where it is needed.

What has been said concerning dosing for intestinal parasites, applies equally

to medication for enteritis and other intestinal troubles. Any medicine that is left for the farmer to give must be left so it can be given in the feed, or it will not be given at all.

A point in the administration of oil of chenopodium or other medicaments in the slop is to have the odor covered up. It is hard to get hogs to drink feed with a strong, disagreeable odor. The pharmaceutical houses can help out the practitioner in this matter.

I will summarize the medication of swine by saying:

1. Medication of swine too sick to eat is unsatisfactory, and when attempted should be by the hypodermic route.

2. The best results are obtained by administering medicine to hogs in the feed.

3. Medicines properly prepared and rendered as palatable and odorless as possible are readily eaten by hogs that have been starved 24 to 36 hours.

4. In giving drugs to hogs in the feed, it should be administered to but a few animals at a time.

The Feeding of Orphan Pigs

By A. T. KINSLEY, Kansas City, Missouri

ONE of the serious consequences of agalactia in sows is the loss of suckling pigs. The successful feeding of so-called orphan pigs is economically worth while not only in purebreds, but also in grades. It is advisable in the feeding of any mammalian orphan to provide a food that approximates as closely as possible the composition of the mother's milk. According to different investigators, the approximate composition of sows milk is fat 7%, albumen and casein 6%, sugar 5.7% and ash 1%. The fat globule of sows milk is about one-fourth the diameter of the fat globule of cows milk and is therefore more easily digested. The average sow produces from 4 to 7 lbs. of milk daily. The average litter varies from 8 to 10 pigs. Therefore, the average pig consumes about ½ lb. of milk per day.

In caring for orphan pigs, whenever possible, they should be permitted to suckle another sow, at least once or twice, then they can usually be fed on a modified milk. A modified milk that has been fairly successful in supplying the demand of orphan pigs is prepared as follows:

1 lb. cows milk,
1 lb. lime water,
¼ lb. separator cream,
⅛ lb. sugar.

If milk sugar is available and not too expensive, it will be more satisfactory than cane or beat sugar. The ingredients aforementioned should be mixed in clean, sterile vessels and pigs from 1 to 10 days of age should be given approximately ½ lb. equally divided into four or five different feedings daily. The basic principle that pigs should not gain in weight until they are ten days of age should always be kept in mind when feeding orphans. After the pigs are ten days old, the composition of the prepared milk can be gradually changed by reducing the lime water, cream and sugar and when the pigs are three weeks of age they can be fed on whole milk from the cow. Pigs from two to three weeks old can ge given small quantities of grain.

Great care should be used in feeding orphan pigs; all utensils should be clean and sterile. It is not necessary to provide a nurse bottle. If the prepared milk is fed in shallow vessels, the pig will learn soon to drink therefrom.

By following out the foregoing general directions, thousands of orphan pigs can be saved annually.

VETERINARY MEDICINE will be glad to have suggestions not only as to successful treatment of cases of agalactia in sows and other domestic animals, but also the care of any mammalian orphans.

Hairless Pigs—Goitre in Swine

By A. T. KINSLEY, Kansas City, Missouri

MANY hog breeders in the northern portion of the United States and in Canada have extensive losses in their spring pig crop from a condition ordinarily termed hairless pigs. This condition is not abortion.

Extent and Distribution

According to a bulletin issued by the University of Montana, the loss in pigs annually in that state alone, is estimated at about 100,000. Other states have similar losses. From the evidence at hand, it appears that in certain sections this condition is much more prevalent than in other areas. The drainage basin of the Yellow Stone, the lower Missouri, the Musselshell with some of their tributaries are the areas in which the losses are most extensive in Montana.

Ranchmen have found, by experience, that in some instances it is possible to move their brood sows a mile or two from their regular hog lots and produce normal, healthy pigs. In some instances, one ranch or several ranches in a community have no losses from this trouble, while all the surrounding ranches have extensive losses. It has also been found that, as a rule, only a portion of the sows in a given breeding pen will produce hairless pigs and in some instances ninety-five per cent of the pigs farrowed in the spring will be hairless and the same sows will produce practically one hundred per cent of normal pigs in the fall.

According to the reports from Montana, hairless pigs may be produced either when the sows are kept in pens or when running at large. When fed on any combination of grain, hay, roots, etc., and whether fed alfalfa or not. In other words, experience of the Montana breeders is that hairless pigs will be produced regardless of any variation in feed, care or management.

On the other hand, experience of feeders and breeders in Wisconsin indicate that a ration of various grains and with twenty-five per cent of alfalfa added prevents this trouble. They have also found that when young sows were fed on concentrates, such as grains and skimmed milk and a little or no roughage, hairless pigs often result.

Cause

According to all investigators up to the present time, the primary cause of hairlessness in pigs is goitre. Goitre is a condition in which the thyroid glands are affected, due to insufficient iodin in the feed.

Symptoms

The hairless pig has rather a typical appearance when farrowed. The pig is usually about normal size and there may be a total absence of hair or diminished amount of hair. On a closer inspection it will be noted that the neck and head are apparently larger and the skin from the shoulders forward is thicker than normal and has a wrinkled appearance. The hoofs will also be found to be thin and much less durable than in normal pigs.

The experiment station in Montana has carefully examined the thyroid glands of many hairless pigs and they have found that the glands are practically always enlarged.

Prevention

Hairlessness or goitre in pigs is another malady directly traceable to improper feed. It can be prevented by providing a ration containing the proper amount of iodin. In those localities where goitre is common the addition to the ration of one to two grains of potassium iodid daily during the period of gestation of the sow suffices to prevent the malady.

Pyemic Arthritis of Swine

By A. T. KINSLEY, Kansas City, Missouri

PYEMIC arthritis, navel ill, omphalophlebitis or limping disease is an acute infectious disease of recently farrowed pigs, characterized by inflammation of the umbilical tissue and suppurative arthritis. This disease has been more or less prevalent for ages. It is more prevalent some years than in other years. A large percentage of pigs may succumb to this malady in certain communities every year and other communities may be relatively free of the disease. Males and females of any and all breeds are apparently equally susceptible to this disease. This affection is most common in the spring farrowed pigs.

Cause

Pyemic arthritis is primarily an infection, but the specific exciting cause has not been identified. Pyogenic cocci have been isolated, in some cases in pure culture and in other cases in various combinations, and may have been the primary cause in those cases. The *B. pyocyaneus* and the colon bacillus have been identified in some cases, and it is probable that other microbian agents may be factors in the occurrence of this disease. It is generally conceded that the infection causing pyemic arthritis in pigs may be, and probably in the majority of cases is, transmitted from the sow to the pig in the uterus. Infections of the uterus in sows that are not sufficiently virile to produce abortion are relatively common and in such cases pyemic arthritis is of common occurrence in the pigs soon after farrowing.

The infection of pigs *in utero* is direct from the diseased uterus through the placental membranes to the pig. In post farrowing infections, the microbian agent probably gains entrance through the thrombi in the umbilical vessels. By growth in continuity the infective agent would ultimately reach the blood stream and be carried to all parts of the body.

Symptoms

The symptoms usually become manifest within one week after farrowing, although in some cases there may be no evidence of disease until the pigs are two or three weeks of age. Usually the initial symptom is lameness and an indisposition on the part of the affected pig to move. On examination one or more joints are found to be swollen and sensitive. The tarsal joints are most frequently involved. As the disease progresses, and usually within 12 to 24 hours after the lameness has been noted, diarrhea may supervene. This disease usually terminates fatally within two or three days after the onset.

Autopsy Findings

The lesions of pyemic arthritis vary according to the type of infecting micro-organisms and their location in the body. The typical lesions consist of omphalitis and suppurative arthritis. The inflammation of the umbilical vessels may be suppurative or nonsuppurative and there may or may not be abscess formation. The lesions of the joints may consist of a mild synovitis with limited or extensive infiltration, and tumefaction of the synovial membrane. In other cases the synovial membrane will be distended with accumulated pus. If the disease is prolonged metastatic abscesses are prone to occur in various organs such as the liver and spleen. In those cases in which the infection extends to the bladder there will be cystitis probably suppurative in character.

Treatment

Curative treatment is not as a rule satisfactory. Some practitioners have reported the successful treatment of some cases by injecting about 10cc of blood serum obtained from the tail of the sow into the muscle or the peritoneal cavity of the pig. Other practitioners have reported some success by two or three injections of a properly prepared bacterin into the sow during the later stages of pregnancy.

From observation it becomes evident to the unbiased observer that pyemic arthritis in pigs is primarily due to the breeding of sows with infected uteruses. Breeding only healthy sows will practically eliminate this disease.

Pulmonary Ascariasis of Swine

By BENJAMIN SCHWARTZ, Washington, D. C.
Senior Zoologist, Zoological Division, Bureau of Animal Industry,
U. S. Department of Agriculture

As a result of discoveries concerning the life history of Ascaris first published in 1916, previous conceptions regarding the behavior of the young parasites in the body of their hosts became considerably modified. It was first shown by F. H. Stewart, a medical officer in the British army, and later confirmed and considerably extended by the late B. H. Ransom and others, that the young worms after hatching in the digestive tract do not settle down at once in the intestine, as had been believed.

It was found instead that the young worms enter the blood stream and are carried by the circulation first to the liver and then to the lungs. It was further discovered that the young worms make their way from the lungs to the trachea by upward migration, thus reaching the pharynx, from which they come down again through the esophagus and stomach into the intestine, where they settle down and develop to maturity. The roundabout journey of the young worms through the blood stream and the air passages requires about 10 days for its completion, after which growth to maturity occurs in about 10 weeks.

In passing through the lungs the larvae were found to injure that organ and if many larvae passed through at the same time a serious pneumonia was produced which frequently terminated in death. These observations were first made on small, laboratory animals, such as mice, rats and guinea pigs, and later on pigs. In the course of experiments with pigs it was found that these animals did not recover fully from the setback that they received as a result of the lung injuries produced by migrating larvae. The experimental pigs became stunted and in many other ways failed to develop at a

A common condition observed on many farms. The swine covered with mud, indicate a hog wallow is permitted or maintained on the premises. The small pig on the extreme left is a runt. Runts and unthriftiness are in many instances due to parasites. Hog wallows, ascarids and runty pigs are commonly found together.

normal rate.

Observations on lung troubles in pigs as a result of the migrations of Ascaris larvae were first made on animals experimentally infected with embryonated roundworm eggs. In these experiments it was found that very young pigs, from a few days to a few weeks old, were most susceptible to infection with the worms and that they suffered more severely as a result of it than did older pigs. Pigs several months old or older were found to be only slightly, if at all, susceptible to infestation with the roundworm.

The symptoms produced by Ascaris larvae migrating through the lungs depend on the number of larvae going through at the same time or in rapid succession. In cases in which few larvae go through, no symptoms may be apparent, but if many larvae go through at the same time or in rapid succession there is a rapid, spasmodic breathing, with a pronounced and abrupt movement of the flanks, coughing, loss of appetite, emaciation and general unthriftiness. Even though a fatal pneumonia does not develop, recovery from pulmonary ascariasis is usually not complete, the animals remaining more or less stunted.

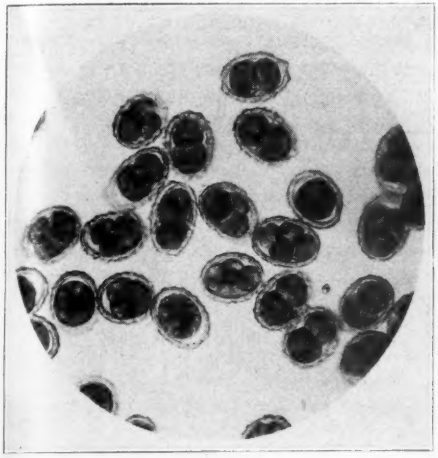


Fig 1, showing cell division of ascarid ova in the process of development. In the various stages of cell divisions the ova are not infective until active embryos develop within the eggshell, the stage shown in Fig. 2.

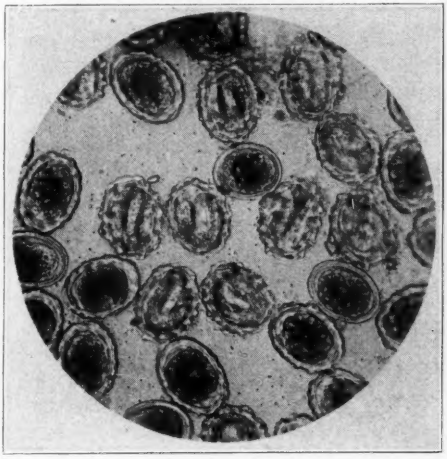


Fig. 2, showing vermiform embryos within the eggshell. In this stage of development the ova will infect when swallowed by a suitable host.

Observation on lung troubles in pigs due to migrating ascarid larvae were soon extended from pigs used in experiments to pigs on farms that had acquired a natural infection with the worms. In naturally infected animals a form of lung trouble commonly known as "thumps" was found to be due in many instances to Ascaris larvae going through the lungs, thereby affording a sound explanation for this condition which had been previously explained by various theories now known to be inaccurate for a large proportion of the cases.

Post-mortem examination of the lungs reveals numerous petechial hemorrhages, the latter being the points where the larvae are or have been present. Press preparations of small portions of such infected lungs usually reveal the presence of Ascaris larvae. Yokogawa found that Ascaris produces a bronchopneumonia in pigs and in view of the incidence of this condition he designates this pneumonia as Ascaris pneumonia or parasitic pneumonia.

Scour in Pigs

By A. T. KINSLEY, Kansas City, Missouri

SCOUR is one of the most widespread of the fatal diseases of suckling pigs. It has been estimated that from seven to ten million pigs die annually, in the United States, from this malady. Some breeders have lost from 10% to 25% of their pig crop for several successive years from scour. In some instances this disease exacts a toll of from 50% to 80% of the entire number of pigs farrowed. One breeder in Missouri lost over 200 of 300 pigs farrowed during 1925 from scour. The disease has been proportionately more prevalent in the centers of greatest hog population.

Pig scour is most common in young pigs, the majority of cases occurring within the first ten days, although the condition may occur up to six weeks of age.

Cause

There is a variety of conditions and agencies that are factors in the occurrence of pig scour. Damp, dark, dingy hog houses, insanitary lots and sudden extreme temperature variation predispose to this disease. The exciting cause of the majority of cases of pig scour is improper diet. The feeding of the sow with contaminated or moldy food or fermented slops, probably results in elimination of injurious substances in the milk that will create in the pigs digestive disturbances, resulting in diarrhea. Milk from sows affected with mammitis will produce digestive disorders and scour in pigs. Infestation with parasites is another causative factor of this malady. Great care must be exercised in the preparation and administration of artificial feed for orphan pigs otherwise they will die of scour.

After digestive disorders have been established by any of the factors previously enumerated infection plays an important role. No specific bacterium has been isolated that is responsible for all the terminal infections in pig scour. The *B. coli communis, B. suipestifer* and other closely related bacteria are the microbian agents most commonly found in these cases. The *B. Pyocyaneus* and pyogenic micrococci are sometimes demonstrable in the discharge of affected cases and in the lesions of pigs dead of the malady.

It is possible that certain microbian agents may attain a pathogenicity and produce a primary infectious scour. Thus, the rapid spread of the disease in a litter of pigs and the dissemination from litter to litter and from farm to farm is indicative of the infectious nature of pig scour.

Symptoms

Pig scour is characterized by diarrhea, the evacuations in the beginning are pasty in consistency and of a gray or slate color. Later the discharges become more watery and have a very disagreeable odor. The pigs tail and hind parts become soiled. The longer the disease persists the more fluid and fetid are the discharges. The appetite is good in the beginning but the affected pig soon loses all desire for food. There is abdominal pain evidenced by the affected pigs kicking the belly, squealing, grunting and by their restlessness. They have a dejected appearance, standing with head down, tail drooping, tucked abdomen and rough coat. Emaciation is rapid and the affected pig becomes weak and dies of exhaustion.

Lesions

There are no specific lesions that characterize pig scour. There is soiling of the tail and hindlegs, tucked abdomen, rough coat and unless the disease is very acute there is marked emaciation. The digestive tract may be practically empty. Any content in the intestine is fluid and usually putrid. There may be areas of congestion in the intestinal mucosa. In subacute or chronic cases there may be inflammation and ulceration of the mucosa in the stomach or intestine.

Treatment

The success of treatment of pigs affected with scour will depend upon the vitality of the pig, the cause of the malady, and the stage of the disease. As a rule pigs affected with scour have little vitality and therefore do not respond to treatment. Those pigs that are fairly strong and are in the early stages of the disease will survive, if the diet is corrected.

The use of castor oil after correcting the diet serves the double purpose of eliminating the bowel content and soothing the irritated mucosa but requires time and care to administer. If the diarrhea persists after providing the proper diet for the sow and the administration of castor oil small doses of bismuth subnitrate may be used to advantage.

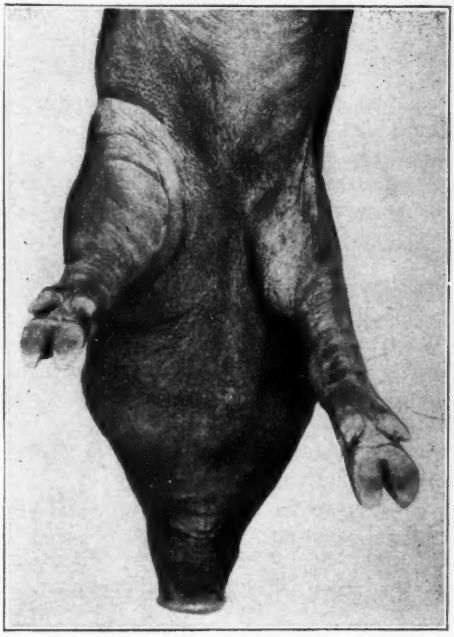
When scour is due to infection with *B. suipestifer* or related microbes the use of a bacterin made from cultures of those organisms will be of value not only as a preventive agent in exposed pigs but also as a curative agent in those affected.

Generally considered, scour in pigs is primarily of dietary origin and its prevention depends upon providing the proper diet.

MALIGNANT EDEMA IN SWINE

Autopsy Findings:

The left side of the neck and the left shoulder were extremely swollen and finger impressions remained for some time. On opening the edematous areas, a great mass of dark violet, putrefactive material having the odor of isobutyric acid, was found. The subcutaneous connective and fat tissues were very edematous and of a hemorrhagic gelatinous appearance. The muscular tissue was intensely hemorrhagic, and almost liquefied. The lymph-glands of this region were gray white, swollen, edematous and contained many punctiform hemorrhages throughout the lymphatic substance. On sectioning the deeper sutures of the left shoulder, the hemorrhagic edema was found to extend into the axillary region and a part of the thoracic and abdominal region was involved. The lungs were light pink in color; on section, fluffy, slightly edematous and congested. The heart showed a marked parenchymatous degeneration. The myocardium was very friable, easily torn and of a parboiled appearance. On opening the abdominal cavity, about 500cc of a clear yellow exudate escaped. The liver was swollen, friable and pale gray. A few irregularly outlined hemorrhagic areas were seen on the surface. The spleen were not enlarged but was dark red in color and of a firm consistency. The kidneys were brownish red, showing a few



Pig affected with malignant edema. Note the edematous swelling of the neck and left shoulder region.

isolated petechiæ. On section, the cortex was seen to be enlarged, gray brown and cloudy. The gastro-intestinal canal was free from any noticeable lesions. The gastric lymph glands were swollen and deeply hemorrhagic. The urinary bladder contained about 400 cc of a clear yellow urine. The mucous membrane was slightly swollen and congested.

F. Proescher.

Technic and Interpretation of Post-Mortem Examinations

By J. S. KOEN, Bloomington, Illinois

ALTOGETHER too little importance is given to the technic in holding an autopsy or post-mortem examination. Every pig "posted" should be considered a possible cholera subject. Its blood should be considered virus, and every precaution taken to prevent it from being scattered about the lots or premises. The veterinarian should make the owner realize its possible danger and that it must be controlled and killed. It is gross carelessness for him to step in it or permit others to do so.

After the hog is killed and bled, it should be held on its back and the thoracic and abdominal cavities opened by lateral incisions from the angle of jaws posterior to the pelvis. An examination of the cervical glands, the glottis, inguinal glands, bladder, kidneys and spleen can be made without the hands being soiled to any extent. Next the lungs and heart. Lastly the liver, stomach and intestines, care being taken that the contents of stomach and bowels are retained in the abdominal cavity.

The foregoing can all be accomplished without detaching any organ from its natural attachments and with very little muss, so that when you are through the skin can be tied together with wire and no portion of carcass or organs are left to be scattered elsewhere. The carcass should then be burned. The ground where the blood was spilled should be soaked with a strong disinfectant that has been in evidence while the autopsy was held. The estimation of the owner regarding your ability is often enhanced by a careful technic on autopsy.

Diseases of swine are recognized by lesions as in other species, cholera not excepted. Practitioners and field investigators must disregard the mistaken idea that cholera is a lesionless disease. If this were so, the only time you would be warranted in making a diagnosis of cholera would be when you had no evidence to support your decision.

Cholera. This disease does present definite lesions. Three of them are so constant they may well be classified as characteristic. They are:

1. Peripheral congestion of lymph glands, especially the cervical and meso-colic glands.

2. Ecchymotic hemorrhages on the lung. These are distinct, circumscribed hemorrhages varying somewhat in size, but larger as a rule than the petechia found elsewhere. They do not rub or wash off, nor do they run together as the knife is drawn across the surface of the lung. These are probably the most constant lesion of cholera.

2. The spleen is usually involved in cholera. There may be only congested areas, but more frequently it is enlarged, soft and pulpy and darkened in color.

Other petechial lesions are not so constant, therefore not so important. I consider the petechia of the kidneys as of minor importance. Lesions may be found also on the glottis, heart, bladder, stomach, liver and gall bladder. The bone lesions are of little importance in field work.

Flu. The lesions most frequently encountered in flu are enlarged and congested lymph glands of the cervical region, the congestion extending throughout the glands; lobular pneumonia areas, that give the lung a sort of mottled appearance; an area of inflammation surrounds the bronchi and bronchioles, involving but a small portion of the lung tissue; frequently enlarged and congested bronchial glands, and quite constantly congestion of the mucus lining of the trachea.

Necrotic Enteritis. In this disease there is a diffuse necrosis of the mucous membrane lining either the large or small intes-

tine. The membrane affected may be much thickened, and either tough, or granular and mealy. Frequently we find the necrosed membrane assuming the character of a false membrane lining the cecum. It is thin, dark in color, and on removal discloses a very acute inflammatory condition beneath it.

Swine Plague or Hemorrhagic Septicemia. The lesions of this disease predominate in the thoracic cavity. They are characterized by diffuse or blotchy hemorrhages of the serous membranes or organs. There may also be similar hemorrhages in the abdominal cavity and in the muscle tissue. Wherever found, the hemorrhages will be irregular in outline. The bronchial lymph glands, or any others that may be affected, will be congested throughout. In the very beginning there may be only small hemorrhages on the heart, or extreme congestion of the lungs that will be followed later by all stages of hepatization. There is usually more or less pleuritic adhesions. The spleen is not involved.

Infectious Rhinitis—Bull Nose of Pigs

By A. T. KINSLEY, Kansas City, Missouri

BULL nose or sniffles in pigs is probably infectious and is characterized by inflammation of the mucosa of the nasal chambers and related sinuses and by involvment and deformity of the facial bones. Although this condition is similar to nasal catarrh, it is more severe and destructive. Bull nose is quite prevalent and is responsible for the loss of many pigs in various locations each year.

As a rule, when bull nose first appears on a farm, only a few pigs become affected, but each succeeding year the percentage of infected pigs increases and by the fourth or fifth year after the disease first occurred it is not unusual for 25% to 40% of the pig crop to become affected. The increase of the disease from year to year on certain premises is indicative of an infection as its cause. It has been noted that bull nose is more common in pigs that are kept in pens and lots that had been used for swine for several consecutive years than it is on new ground.

This malady is more prevalent in herds in which no new breeding stock has been introduced for several generations than it is where in-and-in breeding is not practiced.

Bull nose may occur in swine on a farm where this disease had not previously existed after the introduction of apparently healthy pigs from a farm where the disease did exist. It may also develop in healthy pigs taken from a farm where there was no bull nose, and yarded in lots where cases of this disease have previously existed.

The duration of an attack of bull nose is variable. The disease is relatively short in those cases in which there is a marked toxemia due to the absorption of the bacterial products. If the disease remains localized the affected pig may live for a year or even longer.

Cause

Filthy pens, improperly ventilated hog houses, the continuous use of the same lots and sheds, and in-breeding are factors that predispose to bull nose. The occurrence of this malady in a herd soon after the introduction of pigs from a diseased herd, and also the development of the disease in pigs from a healthy herd that are confined in lots that have been occupied previously by affected pigs indicates that the malady is of an infectious nature; that apparently healthy pigs may be carriers, and that the infection persists on the premises. The *B. pyocyaneus* can be demonstrated in the nasal discharge and lesions of a large percentage of cases of bull nose and may be the specific cause. This microorganism is quite widespread, occuring in soil, manure heaps, and stagnant water.

Symptoms

Sneezing or blowing is usually the first evidence of this malady, hence the name sniffles. There is usually an acute nasal catarrh manifested by a watery discharge in the beginning which later becomes purulent or mucopurulent. The affected swine have a tendency to root and to rub the end of the nose against posts, boards or walls. They eat very little, consequently they do not gain in weight and they soon become gaunt and unthrifty. There is usually a conjunctivitis characterized by a purulent discharge and adhesion of the eyelids.

In the later stages of bull nose there is bulging of the facial bones, thus producing deformity of varying degrees. The snout may be turned upward or sidewise. The involvement of the nasal mucosa and the facial bones interferes with respiration and breathing is usually associated with a peculiar blowing noise.

Lesions

Pigs affected with bull nose are usually unthrifty, emaciated and small for their age.

Acute catarrhal inflammation of the nasal mucosa, manifested by congestion and tumefaction characterizes the initial stages of bull nose. As the disease progresses the inflammatory process becomes purulent and there is usually a dirty gray, sticky exudate upon the mucosa. In some cases variable sized areas of the mucosa become necrotic and the underlying osseous tissue is invaded and becomes cancellated and tumefied thus producing the bulging of the facial bones and the sequential deformity. The hard palate may be forced downward, diminishing the oral cavity.

The inflammatory and necrotic processes extend from the nasal mucosa and involve the mucous membrane of the various facial sinuses and the conjunctiva is usually similarly affected. There may be metastasis of the purulent processes evidenced by abscess formation, particularly in related lymph nodes.

Diagnosis

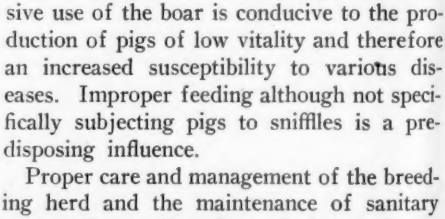
Bull nose may be confounded with necrotic stomatitis. Bull nose is essentially a chronic malady and the lesions are without odor. It is differentiated from necrotic stomatitis by the latter being acute and characterized by an intense inflammation of the buccal mucosa, in which the inflamed membranes pass through the successive changes of congestion, tumefaction, necrosis and erosion. In necrotic stomatitis the affected tissue has a peculiar disagreeable pungent odor.

Treatment

The value of curative treatment is doubtful excepting in the very early stages when medication by inhalation of such agents as oil of eucalyptus or tincture of iodin may be beneficial providing the patient can be properly confined in an air-tight chamber or in such a manner that they can be medicated with a vapor or steaming bag. Those cases in which there is bulging of the facial bones are practically hopeless and should be destroyed.

Bull nose is a preventable disease and the cost of instituting effective preventive measures is not prohibitive. Successful swine production is dependent upon good farm sanitation exemplified by rotation of pens, lots and pastures, and clean sleeping quarters. Filth is an enemy to health and normal development of swine. Sexual hygiene must be given more consideration by the swine producer. Inbreeding and excessive use of the boar is conducive to the production of pigs of low vitality and therefore an increased susceptibility to various diseases. Improper feeding although not specifically subjecting pigs to sniffles is a predisposing influence.

Proper care and management of the breeding herd and the maintenance of sanitary surroundings will reduce pig losses due to bull nose to a minimum.



Swine Erysipelas

By A. T. KINSLEY, Kansas City, Missouri

SWINE erysipelas is more or less prevalent in swine in the United States. Diamond skin disease, a mild, chronic form of swine erysipelas has been recognized, particularly by veterinary inspectors in packing houses, for many years. Recently an acute fatal type of this malady has been identified in Missouri, Kansas, Colorado, South Dakota, Iowa and Illinois.

Etiology

The cause of swine erysipelas is a small Gram-positive, rod-shaped bacterium. This micro-organism is pathogenic experimentally for mice, rabbits and pigeons. A condition designated "salt water erysipelas" of fishermen is attributed to the same bacterium. Recent findings by Ray of the Kinsley Laboratories, appear to indicate that the causative microbe of swine erysipelas may be an etiologic factor in some disease conditions in other animals. The mode of dissemination of the infection from diseased animals, the resistance of the micro-organism and the exact manner of natural infection has not been determined. The disease does not as a rule spread rapidly to all of the swine on a given farm. In fact, in most instances only a relatively small percentage of swine become affected, however, the infection apparently persists when it has once been introduced.

A case of swine erysipelas in which the joints, particularly of the front legs, are involved.

Lesions

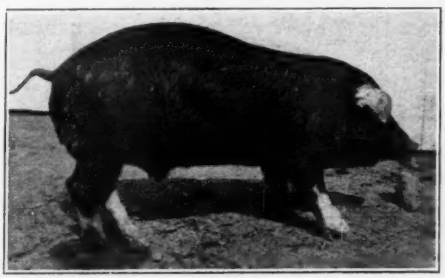
The lesions of the mild, subacute or chronic form of swine erysipelas consist of:

1. The so-called diamond skin disease, a diffuse dermatitis of varying intensity. The skin involved may become necrotic and slough as indicated in the accompanying illustrations.

2. Arthritis involving stifle hock, tarsal and carpal joints, the frequency of involvement probably in the order mentioned. Joint lesions vary from a mild inflammatory disorder in which the synovial membrane is slightly congested and the synovial fluid cloudy to a chronic proliferative inflammation in which the synovial fluid contains flocculi and the joint is more or less deformed because of the excess fibrous tissue.

3. Enlarged edematous lymph glands that may or may not be hemorrhagic.

4. Vegetative endocarditis in which the valves of the heart are covered with a cauliflower-like deposit of fibrin.



A barrow suffering from swine erysipelas, in which the tail was involved. The tail in this particular instance was stiff and showed a line of demarcation near the body where it would soon slough, and shows also sloughing of the right ear.

The skin lesions are frequently observed by the practitioner in the live hog but the joint and lymph gland lesions are usually not observed because such

cases are not as a rule fatal unless there are complications. The skin, joint and lymph gland lesions may occur singly or in various combinations. Again, the skin lesion alone may be observed in one hog, the joint lesion in another and the lymph gland lesions in still another on the same farm. In a more severe form of the disease there is swelling and later sloughing of the ear and sloughing of the tail and feet.

The septicemic form of the disease is characterized by parenchymatous degeneration of the vital organs, and there is usually an edematous tumefaction of various lymph glands, the spleen may be tumefied and there may be hemorrhages into the digestive mucosa or an acute gastro-enteritis. In some cases the disease is so rapidly fatal that there are no definite lesions.

Symptoms

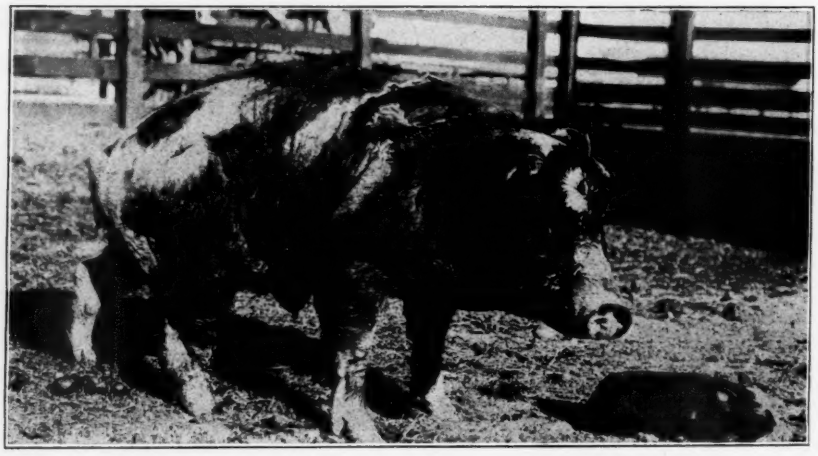
The symptoms of the mild form of the disease are indefinite. There may be cutaneous erythema (diamond skin disease) skin sloughs, lameness, enlarged joints, sloughing of ears, tail or feet, depending upon the apparent localization of the infection. The septicemia form of the disease has a sudden onset. The affected animal is indifferent, usually refuses food, retches frequently and may vomit; has a high temperature, and may evidence disturbance of the cerebral functions. There is marked weakness and a tendency to incoordination in the hindlegs. The conjunctival mucous membrane may be congested and the eyelids swollen. There may be grinding of the teeth and diarrhea is usually present. This form of the disease runs a rapid course and is usually fatal.

Control

Control measures consisting of isolation of affected individuals and the rigid application of sanitary measures are undoubtedly of value in preventing the spread of this malady.

In several instances a herd autogenous bacterin has apparently given good results in preventing the spread of the disease.

Swine erysipelas in itself is not serious, however, it not infrequently occurs as a complication of other diseases in which the losses may be extensive.



The accompanying illustration is from a photograph presented by the veterinary division of the Texas A. & M. College. This sow was sent to the college to ascertain the cause of the condition. Within a few days after the sow was received she farrowed two live pigs, one of which is shown in the picture. The picture is quite suggestive of swine erysipelas.

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Sarcoptic Mange in Hogs

By BENJAMIN SCHWARTZ, Washington, D. C.
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U. S. Department of Agriculture

MANGE affects those parts of the hog which are of greatest value, namely the hams, shoulder and bacon, with the result that some packers purchase mangy hogs at a discount ranging from fifty cents to one dollar and fifty cents per hundredweight, thus making a considerable loss in the sale price for a hog weighing 250 pounds. In addition to this loss in the sale value of such diseased hogs, it is also important to consider the loss of feed and extra care involved in the fattening of mangy hogs. Proper care and treatment of mangy hogs will do away with the losses in market value and save the extra care and feed required to fatten such diseased animals.

The Parasite and Its Life Cycle

The parasites responsible for sarcoptic mange in swine are known to zoologists as *Sarcoptes scabei suis*. They are small, whitish, more or less rounded organisms, the mature females being about 1/50th of an inch long and the mature males being about 1/60th of an inch long. Although these parasites are visible to the naked eye, a microscope is ordinarily required for their detection in skin scrapings.

The entire life cycle of the sarcoptic mange mite of swine may be completed in 15 days, although a longer period may be encompassed. The adult mites live in burrows in the skin in which the female deposits from 10 to 25 eggs during the egg-laying period, which lasts from 12 to 15 days, after which the female dies. The average period of incubation of the eggs on a hog is about four days, and the average period from the time of hatching until egg laying begins is about 11 days.

Symptoms of Sarcoptic Mange in Swine

Although sarcoptic mange in hogs may start on any part of the body, the early stages of the disease usually occur around the eyes, nose or ears, and from these parts the lesions spread over the neck and shoulders and finally may involve the entire body.

As the mites penetrate the skin a swollen and inflamed area about the size of a pinhead is found around each burrow. These diseased areas, which have a dried, yellowish granule of serum exudate adhering to them, increase in number as the disease progresses and finally coalesce. The affected areas of the skin become almost entirely devoid of hair, and present a dry, leather-like appearance. As a result of intense itching the animal scratches or rubs the affected parts of the skin, causing the skin to become raw, and as a consequence of this the small granular areas run together and large scabs are formed over them. The large scabs may be broken by the movements of the animals and blood and serum may ooze out from the scabs. In advanced untreated cases the skin becomes denuded of hair and is greatly thickened and wrinkled. The animal becomes greatly emaciated and weakened and, in the absence of treatment, may succumb to the disease.

Treatment for Sarcoptic Mange in Swine

Sarcoptic mange in swine can be treated most effectively by dipping. If a dipping vat is not available the hog wallows may be medicated. In the absence of dipping vats or wallows or if the weather is unfavorable for those procedures hand applications or spraying may be substituted.

Crude petroleum is the only dip that is known to eradicate both lice and mange with one dipping, and is moreover the most effective and most economical dip for these external parasites of swine. The

lime-sulphur dip is effective against hog mange when four or more dippings are given with an interval of six or seven days between dippings. Coal-tar-creosote dips have not proved to be dependable for eradicating mange. Arsenical dip as used for eradicating cattle ticks in the South is effective against hog mange when four dippings are given with an interval of six or seven days between dippings.

When hog wallows are used crude petroleum or lime-sulphur dip may be added to the wallows. If hand applications are used any one of the following substances will prove effective: (a) crude petroleum, (b) equal parts of cottonseed oil and kerosene and (c) kerosene and lard in proportion of ½ pint of the former to 1 pound of the latter. The crude petroleum is the most effective of these remedies. If spraying is resorted to, any of the dips recommended for hog mange may be employed.

Infectious Necrotic Enteritis of Swine

By A. T. KINSLEY, Kansas City, Missouri

NECROTIC enteritis is quite prevalent in many sections of the corn belt and it is probable that there will be many herds of swine in which there will be post vaccination losses. Although a variety of conditions may be responsible for post vaccination losses of swine, it is evident that one of the important factors during the fall of 1928 will be enteritis.

Occurrence

Pigs weighing 30 to 50 pounds are most frequently affected with infectious necrotic enteritis, although it *may* occur in recently farrowed pigs and in aged hogs. Breed appears to play no part as regards susceptibility to this disease. The condition of the swine undoubtedly is a factor in susceptibility; however, shotes in the best of condition become affected. Climatic conditions have little or no influence in the prevalence of infectious necrotic enteritis, although the disease appears to be more common in late spring and early autumn, probably because that is the season when the majority of the pig crop is at the most susceptible age. Sanitary conditions in which the swine are maintained have an influence upon the susceptibility of swine to the infection; however, the disease may prevail in swine that are kept in clean sanitary quarters. Food seems to have little, if any, influence upon the prevalence of the disease, although insufficient or poor quality of feed would no doubt predispose to this disease, the same as to any other diseased condition.

Etiology

From experimental data it seems justifiable to conclude that the *B. suipestifer* is the primary cause of enteritis in swine. Other microbian agents are demonstrable in the lesions of necrotic enteritis but these microorganisms are probably only secondary invaders. No doubt, intestinal parasites are important predisposing factors, because of the injury they cause to the intestinal mucosa which provides a favorable field for action.

Contaminated feed or water taken into the digestive canal is probably the usual avenue of entrance of the infection.

Lesions

The principal lesion of infectious necrotic enteritis involves the intestinal mucosa. The acute type of the disease is typified by congestion of varying intensity.

The subacute or chronic form of this disease is characterized by a subacute or chronic inflammation. In some cases the lesions indicate that the infection begins in the lymphoid tissue (Peyer's patches and solitary follicles) of the intestinal mucosa near the ileo-cecal valve. The

lesions may be found in any portion of the digestive tract including the stomach, but are usually more extensive in the intestine.

In the beginning the lymphoid areas become congested and tumefied and later undergo necrosis. In other cases the lesions are apparently not confined to the lymphoid tissue, but invade the mucosa which becomes congested, tumefied and necrotic. When large areas of the mucous membrane became involved, the lesion appears as a diphtheritic inflammation because of the adherent necrotic tissue. In some cases the entire intestinal wall appears thickened and friable, due to the accumulated necrotic tissue. Some cases are observed in which the necrotic tissue has sloughed, leaving the intestinal wall relatively thin and inelastic.

In prolonged cases or the chronic form of this disease the so-called "button ulcer" is of common occurrence. This lesion occurs when the infection is apparently localized in solitary follicles or Peyer's patches and the inflammatory and necrotic processes extend by continuity, the necrotic tissue remaining intact or accumulating as dirty brown masses with raised margins. Microscopically the surface epithelium in the affected areas and the lymphoid tissue are found to be in various stages of degeneration and disintegration. The degenerated and dead cells commingle with the coagulated inflammatory exudate and appear upon the surface as an adherent mass—the "button."

The mesenteric lymph-glands through which the lymph passes from the infected mucosa are tumefied and may be congested and hemorrhagic. In the subacute or chronic cases the central portion of the lymph glands may be necrotic. The peritoneum adjacent to the involved intestine is invariably affected with a subacute or chronic inflammation. The peritoneal inflammation is manifested in the early stages by an excessive outpouring of serous fluids, but as the process continues there is a tendency to organization and limited fibrous proliferation which is prone to produce adhesions.

Symptoms

The symptoms of infectious necrotic enteritis are variable, and the intensity of the symptoms manifested is not proportioned to the intensity and extent of the lesions. Hogs apparently in the best of health may reveal lesions indicative of a chronic infectious enteritis on autopsy while swine manifesting the usual symptoms of this disease may show very limited lesions on autopsy. The infection acts rapidly and is highly destructive in some cases but is slow going and rarely fatal in other cases.

An acute septicemic type characterized by a high temperature, inappetence, arched back, frequent urination and blue belly is sometimes observed, however, the disease is usually subacute or chronic and the first symptom noted is depression.

This disease may affect only a few animals in a herd or a few animals may be affected at one time, and they either die or recover and others in the same herd become infected, the disease thus ultimately affecting all swine on a given farm. In other instances practically all of the swine show evidence of the disease at the same time.

The affected animals are dull and separate themselves from the other swine. The appetite is diminished, although it may not be noted by the caretaker. In some outbreaks the first evidence of the disease noted is the general dullness. The owners will report that a large percentage of the hogs lack activity and appear dull and depressed. As the disease progresses digestive derangements become more evident and are manifested by ir-

regular appetite and diarrhea. The affected individuals at this stage appear unthrifty, have rough coats, and arched backs. The fecal discharges are quite fluid and of variable color, depending upon the feed.

The affected individuals become emaciated, thin and weak and may die of exhaustion or they may ultimately recover. The temperature varies from normal to 105° F. or 106° F. during the active stage of the disease, but in the later stages it is not unusual to record subnormal temperatures. In uncomplicated cases, no pulmonary disturbances are manifested.

Diagnosis

The diagnosis of the disease requires an autopsy of one or more cadavers. The characteristic lesion upon which judgment is based occurs in the intestine and consists of an inflammation in which some of the involved tissue has become necrotic and is adherent to the intestinal mucosa. The finding of these lesions when coupled with a definite history of the outbreak and observation of the leading symptoms—irregular appetite, diarrhea, dullness and variable temperature, is usually sufficient evidence upon which to make a positive diagnosis.

Prognosis

The prognosis should be guarded. If the infection is relatively mild the percentage of deaths will be small but the loss of condition of the affected animals may produce an extensive economic loss.

Control

Sanitary requirements are frequently ignored by the hog feeder and breeder. Although infectious necrotic enteritis may occur in swine that are maintained, in clean pens and properly housed it is far more prevalent in swine that are kept in mud and filth. There is a tendency for the larger feeders to keep too many hogs in one lot, a fault that is conducive to the rapid spread of any infectious disease. The men who are most successful in swine husbandry watch their herds carefully and at the first indication of any defect or disease isolate the affected animal. Quarantine is the first principle in controlling the spread of infection and to be most effective isolation should be absolute.

Rigid enforcement of quarantine regulations in the early stages of infectious necrotic enteritis will materially diminish the losses occasioned by this disease. Slop foods of good quality should be provided for affected animals. They should be kept in comfortable quarters and the droppings should be gathered daily, disinfected and properly disposed of. All dead animals should be burned or buried sufficiently deep and limed to destroy infection.

Prevention

The *B. suipestifer* probably does not inhabit the intestine of normal swine; therefore, its presence signifies a carrier or a diseased animal. The organism is eliminated in the fecal discharges, and soils, feed and water are thus contaminated. Pens, lots, sheds and runs that have been occupied by diseased animals should be thoroughly cleaned and disinfected before other animals are placed therein. Since intestinal parasites predispose to infection with the *B. suipestifer* all swine should be periodically "wormed out."

Various biologic agents claimed to be of value as immunizing agents are available. The *B. suipestifer* produces an endotoxin and it is probable that an opsonic immunity can be produced by a bacterin made from it. Reports of the successful use of such a bacterin are found in practically all veterinary journals. Extensive losses in stock hogs, that had been immunized against hog cholera in public markets, have been due to infectious necrotic enteritis.

Treatment

Affected swine should be provided with easily digestible alkalinized slop foods and placed in comfortable quarters. Intestinal antiseptics are indicated. The antiseptic selected should be such as can be administered in the slop.

The Humane Killing of Pigs

By MAX MILLER, Munich, Germany
Professor for the Hygiene of Meat at the University of Munich

UP to now the slaughtering of pigs has not been in accordance with the demands of humanity. I recall the statements of Paddison, Wood, Anthony, Mayall, and Ross Grant, in the special number of the English Veterinary Journal of September, 1927. Here the reason is given why, as a rule, pigs are bled without any preliminary stunning. Especially many bacon curers are of the opinion that pigs which have been stunned prior to bleeding are inferior to those bled without any preliminary stunning. Many practical men in the bacon curing trade are very definitely opposed to mechanical stunning. They believe that the flesh of a large percentage of the pigs, stunned in this manner, cannot be preserved as bacon or in other forms.

The shortcomings of mechanical killing are well-known to me in my position as head of the sanitary department of the public slaughterhouse in Munich. Here these disadvantages of the mechanical killing had to be accepted for want of a better procedure. In England and the United States the mechanical killing is mostly rejected in consequence of the supposed or real shortcomings of this procedure.

It is true that at times bloody splashes are found quite frequently in the muscles after shooting and the bodies are sometimes not well bled owing to the stunning which preceeds the bleeding. The shooting and the stunning in heavy pigs has its difficulties. The lacerations and contusions caused by shooting and the second blow with the pole axe are also economical disadvantages. The bloody tumefactions and destructions of the head make the affected parts unfit for consumption. The driving in of the shooting bolt produces a destruction of brain tissue and a hemorrhage, and the putrefaction of the head will start correspondingly sooner.

All shortcomings mentioned here are avoided in the new process of stunning by electricity, which has been worked out for the slaughtering of pigs by the author in collaboration with Engineer A. Weinberger.

By this procedure the animals are stunned instantly and the bleeding is an excellent one; muscle hemorrhages do not occur and the process itself does not present the least danger for the slaughterer. The animals stunned by electricity can be touched without any danger. If the animals are not slaughtered immediately after the stunning they recover slowly and become quite active again after three or four minutes. If the stunned animals are stuck the animals lying unattached bleed copiously and are completely drained of their blood in a short time. The electrical stunning passes over into anemic unconsciousness, which is followed by the physiological death owing to paralysis of the heart and the lungs.

In stunning pigs by electricity they are put into the pig trap and are touched on the front of the head with a rod, which serves as an electrode. The stunning takes place instantly. After touching the pigs with the rod for 5 to 8 seconds, they are turned out of the trap by tilting the latter, and bled in the usual way without regaining consciousness. The trap is ready for the next batch of animals as soon as it is dumped. The electrical stunning process has the additional advantage over the shooting, that it takes a much shorter time. The current consumption is very low, since an intermittent direct current of 30 to 50 volts is used.

The electrical stunning process for pigs has been used by us in stunning experiments on cattle. Here, too, the electrical process has its advantages in instantly rendering senseless the animals

and depriving them of their own will, whereby a specially good bleeding can be achieved in slaughtering or butchering.

In Germany and in all countries which are interested in the humane killing of pigs the electrical stunning process has aroused great interest. As regards pigs, the electrical stunning process is even now far superior to all other processes.

The process is also destined to play a great part in veterinary practice, in all cases where it is the question of controlling vicious or refractory animals. For throwing cattle, for hoof operations, castrations, etc.; for operations on wild and violent animals, and in all similar conditions it possesses great advantages.

In human medicine as a medium for narcotising, putting to sleep and quieting, it has its uses. The process of narcotising by electricity opens a wide vista; the apparatus designed by us, which permits a continual regulation and dosing of the electrical current free from shock, will enable science to gain important and very interesting insight into the psychomechanics of the human and animal brain. The electrical stunning of animals offers the basis from which progress in this direction can be made.

Agalactia in Sows

By A. T. KINSLEY, Kansas City, Missouri

VETERINARIANS have occasionally reported cases of individual sows in which there was a sudden cessation of milk secretion and occasionally there have occurred several instances in which agalactia developed in from eight to twelve sows on a single farm within a few days.

According to most veterinarians, this condition is difficult to overcome and it is of importance to the breeder because of the loss of suckling pigs from starvation.

The exact method in which the mammary gland cells produce milk has not been definitely determined. The stimulus for milk secretion may be an internal secretion in part and it is thought that suckling or milking is also an important factor. Experimentally it has apparently been demonstrated that the injection of placental extract is capable of stimulating milk production. Agalactia may be a symptom of parenchymatous mammitis, although many of the cases that have been carefully examined appear to have no relation to any inflammatory process in the mammar yglands. Most cases of agalactia occur within three to five days after parturition and usually the first indication of the disease is the gauntness and weakness of the pigs and their persistent attempts to obtain milk.

This condition probably has no relation to the character of the feed of the sow, as it has occurred under all conditions. The age, breed and general condition of the sow are apparently not a factor, in at least many of the cases. It is thought by several investigators that the primary cause of agalactia is due to some disturbance of the endocrine glands.

To prescribe either a preventive or a curative treatment for agalactia, without knowledge of the specific cause would be imperic; however, maltine and other like products are highly recommended by some veterinarians. Ground or cracked barley soaked from 12 to 24 hours, the length of time depending upon temperatures, makes a splendid substitute for maltine and is relatively easily prepared and inexpensive. Probably soaked barley or maltine are of more value as preventives than as curative agents. It is possible that if soaked barley were fed for a few days prior to farrowing and for two weeks thereafter, the occurrence of agalactia could be prevented.

Extract of placenta and mammary glands have been used with favorable results. Such products are obtainable on the market and should be given a trial, in valuable animals.

Swine "Flu"

By J. S. KOEN, Bloomington, Illinois

TO ENCOUNTER a new disease of swine; to be compelled to give it a name; to attempt the description of it; to be censured and ridiculed; was my early experience with swine flu. Later, to have the U. S. Bureau of Animal Industry corroborate my observations, accept the name I gave the disease as "apt" until further investigations shall reveal a more suitable one, and to have the censure and ridicule turned to approval and commendation, is a compliment I appreciate keenly.

Until the early Fall of 1918 "flu" in swine had not been observed. At least, no one had called attention to it. At the time I had charge of hog cholera control work in Iowa for the U. S. Bureau of Animal Industry. Several very competent Veterinary Inspectors were assigned to districts of approximately four counties each to assist with the control work. Cholera was not prevalent; in fact, we were feeling the disease was well under control. Then *bang!*

All at once the weekly reports of these inspectors showed numerous reports of cholera from many sections of the state. Quite naturally this was very discouraging and disconcerting to me. I went from one district to another observing the cases being reported as cholera. There was no discounting the seriousness of the epizootic. I saw more sick hogs in less time than I had seen since the great hog cholera outbreak of 1913 and 1914. Herds that had been vaccinated for varying lengths of time were "breaking" as rapidly as were herds that had never been vaccinated. This added to my grief, for a large part of our work had been directed toward instilling confidence in the serum treatment in the minds of the swine owners.

If these hogs were really sick of cholera it looked like a breakdown in our control efforts, and the many "breaks" in vaccinated herds indicated there was something radically wrong with the serum and virus that had been used in the state. They couldn't all be "serum breaks," neither could they all be "virus breaks." Herds that had not been treated were being vaccinated as fast as serum could be obtained, and many vaccinated herds were being retreated. I "posted" pigs in both classes of herds, as many as I could, to determine similarity of findings in a herd, and in as many herds as I could get to daily. I was carefully noting the history and symptoms in each case, as well as the postmortem findings. After a few days' sickness in the herd the owners felt sure they would lose all. Then a strange thing would happen. About the time the pigs looked as though they should die they would begin to show improvement and recover rapidly. The mortality was very low, 1 or 2 per cent. Another strange thing was showing up. Some herds that were passed up as being "too sick to treat" were recovering the same as those that had been treated, and with no greater mortality.

From the very beginning I doubted that we were dealing with cholera for two reasons:

1. I had faith in our control methods. We had competent veterinary inspectors making the field investigations of all reported outbreaks. We had the co-operation of the practicing veterinarians. We were receiving splendid support from hog owners. Early outbreaks had been reported, investigations made, the herds treated by the local veterinarians (there was practically no farmer vaccination at that time), sick hogs were being confined and dead hogs burned, neighbors were warned, etc., and there was little or no spread from any outbreak. I did not want to believe, I could not believe our control work a failure.

2. I had unlimited faith in the serum treatment. I did not believe, nor could I believe, it possible for so many "breaks"

"to happen" following the use of so many different brands of serum and virus.

I felt it my duty to prove the epizootic was *not* cholera in order that our control work might be justified and the serum treatment upheld. My investigations convinced me that neither the history, the symptoms, the autopsy findings, nor the results indicated cholera. In this conclusion I was happy. But I was still in a position of *status quo* (defined by the Russian sage regarding condition of Gen. Kuropatkin, "in a hell of a fix") for the diagnosis of no other disease with which I was acquainted would fit the disease confronting me. I told everyone interested in the situation we were dealing with a new disease. The same question was shot back at me by all, "What is it?" I didn't know. I only knew it was different.

Human flu was very prevalent at this time. The description of the symptoms of this disease of humans was very similar to those I observed in swine. The feelings of those afflicted corresponded in every way to what the hogs must have felt, judging from their actions. Physicians did not know what to call the disease in humans so they accepted the name "flu." So, for lack of a better name for the disease confronting us, and because I had to call it something, I called it "flu." That the name has been accepted and used for ten years seems to indicate its fitness. Much effort has been spent in an attempt to establish the etiological factors of "flu" and considerable information has been published in recent years. Dorset (Journal of the A. V. M. A., November, 1922) and Murray and McBryde (Journal A. V. M. A., June, 1927, and July, 1928) have furnished the best information to date.

Observations Concerning Flu

History. The herd sickens suddenly and very severely. There is pronounced thumping and coughing, a peculiar cough. They seem sore on their feet, or when in nest lay on breast or assume sitting position. The herd may or may not be immune to cholera.

Occurrence. Flu usually makes its appearance in late summer or early fall and continues into the winter. Shotes in good condition are usually the first to contract flu, although it may attack all ages. An attack does not confer immunity to subsequent attacks.

Cause. Unknown, or not definitely determined. McBryde, Niles and Moskey give the best information as to etiology (Journal of A. V. M. A., July, 1928).

Course. This disease comes on suddenly and spreads through a herd in 24 to 48 hours. The hogs appear very sick for several days, usually five to seven, and then recover very rapidly with a mortality of from 1% to 3%. They often lose in weight as much as five pounds per day, during the attack and this is regained very gradually. It is this loss of flesh with the necessity for large quantities of feed and considerable loss of time to replace it that makes flu a great economic problem.

Symptoms. Loss of appetite, high temperature frequently as high as 108 deg. F., pronounced and peculiar dyspnea and thumping. Heavy, painful, characteristic cough when stirred from nest. Muscular soreness. Congestion of eyes, with a watery discharge that does not mat and gum as in cholera. Nasal discharge.. Rapid loss of flesh with extreme physical weakness. Improvement shown about time death is expected.

Lesions. Enlarged and congested cervical lymph glands and those along the trachea. The congestion extends throughout the glands. An area of inflammation surrounds the bronchioles involving but a small portion of the lung tissue. Later there may develop a lobular pneumonia giving the lungs a mottled appearance. The bronchial glands will show congestion. My opinion is that pneumonia develops as a complication following a relapse of flu and is responsible for much of the mortality.

Treatment. The suddenness of the attack and the rapid progress of the disease through a herd affords little chance for prophylactic treatment. No specific treatment

has been found. However, good, dry, clean bedding in comfortable quarters where drafts can be avoided, a light, laxative diet, plenty of fresh clean water, and attention to prevent the hogs piling up on each other usually results in a favorable termination.

Guiacol compounds either with the feed or by individual dosing has proved the best medication. Bacterins are of little value except in some instances they seem to have aborted the attack somewhat, resulting in less loss of flesh.

In the matter of swine flu the veterinary profession and the swine industry are indebted to the U. S. Bureau of Animal Industry for the research work of Dr. C. N. McBryde and Dr. W. B. Niles especially, and the information they have given.

Castration of Pigs

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General Statement

THE purpose of castration in pigs is too well understood to merit any discussion. These animals may be operated upon at any age, though usually it is performed at from four to six weeks of age. The young animal is usually confined by placing it upon its back so that an assistant may straddle the fore part of the animal and at the same time the hind legs are drawn forward. Another method is to hold the pig up by the hind legs with back to the holder and its fore feet just touching the ground. In this position the neck may be held between the legs of the one holding the pig. This makes for an incision in the scrotum well forward and facilitates good drainage. The field of operation is also less subject to contamination than when the animal is held on the ground.

If the body of the pig is reasonably free from fifth, it is sufficient to brush the operative area with a stiff bristled brush and then paint the region with tincture of iodin or with mercurochrome. Needless to state that the operator's hands and instruments should be surgically clean. We are inclined to believe that too much of this work has been done with an ordinary pocket knife, with the result that the owner soon reaches the conclusion that he is fully competent to perform this operation himself. Nickel plated, gleaming instruments have a good psychological effect upon the owner of the animal.

Operative Technic

1. *Old Operation.* Many laymen and some veterinarians are still using the old operation, which consists in making incisions through the skin, subcutaneous tissues and vaginal tunics, directly over each testicle. The testicle being exposed, it is withdrawn, the non-vascular portion of the cord, which is composed almost entirely of fascia of the cremaster, is divided with a pair of scissors or a knife. The vascular portion of the cord is then divided either by scraping, by pulling it out, or by the use of an emasculator or ecraseur.

In performing this operation, the point to bear in mind is that the incisions over the testicles should be low down and of ample dimensions so that there will be good drainage and so that the outside wound will not heal before the repair to the inside tissues is complete. In addition, the vascular portion of the cord must be divided at a distance approximately midway between the testicle and the inguinal opening. If these precautions are taken, there is only a minimum danger of scirrhous cord formation, and in those cases where the owner of the swine insists upon doing this work himself, we have frequently instructed him in this technic. We have also consistently argued against division of the vascular cord by

"pulling it out," because we consider it not only a possible source of danger but because it is positively unsurgical and lowers the veterinarian in the estimation of an educated client.

The commonest complication following this operation is scirrhous cord formation due to infection with pus-producing organisms. If the veterinarian is called upon to treat this condition, he should subject the patient to spinal or epidural anesthesia as described under the heading of "Swine Obstetrics," after which an elliptical incision is made over the most prominent part of the swelling and by means of scissors the growth is dissected from the surrounding tissues and in the general direction of the inguinal opening.

When the dissection of the scissors has proceeded far enough, the dissection may almost always be completed by means of the fingers, and this is to be preferred as being less conducive to hemorrhage. When the healthy tissues are reached, the entire growth may be ablated by means of an ecraseur. The wound cavity should be packed with sterilized or iodoform gauze and retained in position for twenty-four hours by means of skin sutures. The packing may then be removed and the wound treated as an open one.

2. *Improved Technic.* Many veterinarians during recent years are castrating pigs by an improved method. Literature describing this operation has been issued by the Iowa State College.

The improved operation may be performed with or without anesthesia. If large numbers of animals are to be operated upon, and if there are no complications, it is usually performed without the aid of anesthetics. On the other hand, complications, such as hernia, or possible cryptorchidism, call for the use of anesthetics. The form of anesthesia superior to all others is spinal or epidural anesthesia as described under "Swine Obstetrics" in this issue.

The technic of the operation, after the usual preliminary steps have been taken, consists in making an incision about two inches in length for each of the two testicles to be removed. Each of the incisions is to commence posteriorly at the extreme lowest portion of the scrotum, and is to be carried directly forward. It is carried through the skin, subcutaneous tissue, and the fascia, which is the reflected portion of the external oblique muscle of the abdomen. This exposes the vaginal tunics as they are lodged in the groove between the hind limb on one side and the wall of the abdomen medially. The finger encircles the vaginal tunics and the contained cord of the testicle, and by traction upon it, its attachment to the scrotum is broken down so that the tunics, with the contained testicle, may be lifted out of the incision. The vaginal tunics are now incised longitudinally so as to permit the testicle to be exposed, though it remains attached to the tunics in the region of the epididymis. The vaginal tunics are separated from the cord as far forward in the direction of the inguinal opening as possible, and there they are to be divided. By this means practically all of the vaginal tunics, as well as the cremaster muscle, is removed. The vascular portion of the testicle may then be divided close to the inguinal opening in the usual manner.

The advantages of this operation are that it is a distinctly rational operation in contradistinction to the more or less old empirical method. By the removal of the vaginal tunics and the cremaster, the danger of scirrhous cord formation is virtually obviated, and the incision through the skin is so located as to afford almost perfect drainage. In addition, an advantage in show animals at least, no scar is visible as a result of the operation. Furthermore, if after the operation has been commenced it is found that the animal is affected with a hernia, or cryptorchidism, the necessary steps may be taken without changing the operative area to complete these operations.

Rickets of Swine

By A. T. KINSLEY, Kansas City, Missouri

RICKETS is a disease characterized by diminished calcification in bones. This condition exacts a heavy toll from swine breeders in certain locations. It is more prevalent some years than others. Single cases may occur but it is not unusual for from 5% to 40% of the entire pig crop to become affected. On one farm on which 500 pigs were farrowed in the pring of 1922, 300 of them developed rickets. The disease is more prevalent some seasons than others.

This condition is sometimes confused with paralysis. It is essentially a disease of the young growing pig and occurs in all breeds of swine. Rickets is of considerable economic importance to the swine producer because the losses incident to its ravages are relatively large. The disease does not kill promptly but it causes unthriftiness and the affected pigs do not develop, thus the returns from the pig crop is diminished.

It is possible that rickets may be more prevalent in the larger type hogs than it is in smaller breeds; and according to some breeders it is more common in certain families or strains than in others.

Cause

Rickets is due to a mal-nutrition in which there is insufficient lime salts deposited in the bones. Predisposing factors such as inbreeding, improper feeding, and insanitary surroundings no doubt influence the occurrence of this disease. Rickets has been produced experimentally in pigs that were kept in covered pens, thus preventing exposure to sunshine, although they were provided a balanced ration. Rickets is a condition in which there is insufficient calcium deposited in the developing bones and the condition is more prevalent in those communities in which there is a deficiency of lime in the soil and in the food stuff. Another very important factor in the normal deposit of lime in bones is vitamin D. Thus, it has been shown that there may be an abundance of calcium salts in feed but it is not properly utilized without ample quantities of vitamin D.

From the information available at this time it may be tentatively asserted that the occurrence of rickets is dependent upon three factors, (1) absence of sunshine, (2) insufficient calcium or lime salts and (3) insufficient vitamin D in the feed. The ultra-violet rays are the factor in sunlight responsible for the inhibition of rickets. These rays may be reflected from a clear sky but the principal source is direct sunshine. The exact relationship of ultra-violet rays, vitamin D, and calcium salts in the occurrence or prevention of rickets is an interesting problem that perhaps is not as yet entirely solved.

Symptoms

Rickets is usually manifested in the beginning by weakness, depraved appetite, lameness and, in some cases, diarrhea. Characteristic symptoms of rickets are disturbed locomotion succeeded by bending or arching of the long bones of the legs. At this stage the lying posture is almost continuously assumed. When such animals are helped to their feet they may not support their weight with their hindlegs, although some of them will walk around in the lot on their front feet, dragging their hind quarters. In exceptional instances the affected pig may have the use of its hindlegs, but not of the front legs.

The condition is apparently not paralysis, at least the affected portions retain sensitiveness and the failure to use the parts is due to pain. The affected animals will evidence pain by grunting and squealing, when made to move, and they may walk on their toes or carpal joints.

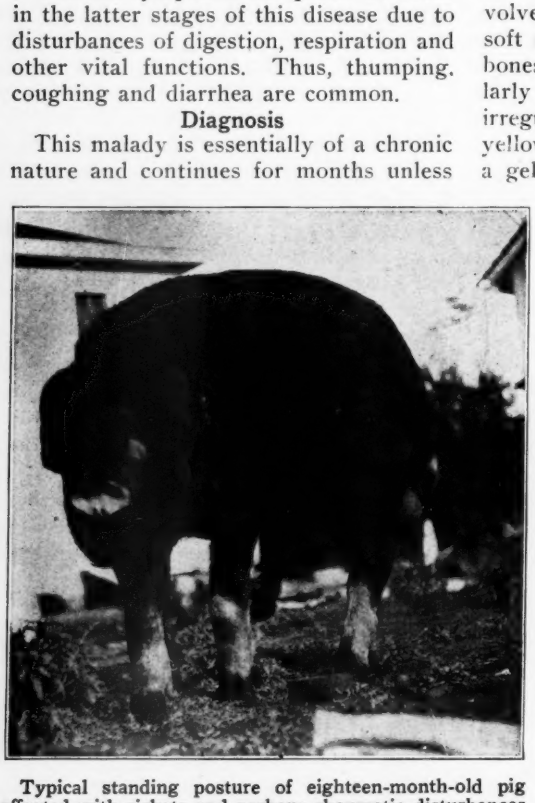
Nervous disturbances evidenced by dizziness, somnolence and convulsions may

occur. As the disease progresses, enlargements of the ends of the bones become evident, appearing as swollen articulations. Bony enlargements may occur elsewhere. There may be disturbed respiration due to bulging of the bones of the front legs and pressure upon the ribs. The vertebral column may be variously curved upward, downward or laterally.

Various symptoms are prone to occur in the latter stages of this disease due to disturbances of digestion, respiration and other vital functions. Thus, thumping, coughing and diarrhea are common.

Diagnosis

This malady is essentially of a chronic nature and continues for months unless death intervenes early, which is exceptional. After the changes in the bones have occurred diagnosis is not difficult. Rickets can be differentiated from articular rheumatism by the shifting lameness that characterizes the latter malady. Tuberculosis of bones can be differentiated from rickets by the application of the tuberculin test. Paralysis due to inflammation of nerves usually occurs in mature hogs or at least hogs weighing 150 pounds or more and can be differentiated from rickets which is more common in shotes or pigs weighing less than 50 pounds.



Typical standing posture of eighteen-month-old pig affected with rickets and perhaps rheumatic disturbances also. Note the bowed front legs and enlarged bones.

Lesions

The tissue changes occurring in rickets are primarily confined to bone tissue and occur most frequently in the long bones of the legs. Other bones may be involved. The affected bones are enlarged, soft and spongy. The ends of the long bones are usually enlarged and irregularly club-shaped. The shaft is usually irregularly thickened and arched. The yellow marrow is red in color and is of a gelatinous consistency. The articular surfaces, particularly of the long bones, may be ulcerated. The flat bones of the pelvis and cranium may be affected and the nose and mouth may be practically obliterated by the enlarged rarefied surrounding bones. The teeth may appear deep set because of the tumefaction of the alveolar tissue. In long standing cases it is not unusual for the enlarged rarefied bones to become relatively dense and more or less deformed.

Treatment

The treatment of swine in the early stages of rickets is advisable, but pigs in the advanced stages of the disease should be destroyed. The affected swine should be placed in sanitary quarters in which there is an abundance of sunshine, and provided a ration that is known to contain ample quantities of vitamin D. and calcium phosphate such as milk and alfalfa hay. Calcium may be provided as bone meal, prepared chalk or lime water.

Rickets can be properly classified as a preventable disease. The proper care and management, particularly the application of rational breeding methods, the proper feeding of the breeding stock, and the infant pigs, and providing sanitary quarters will control rickets.

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Tuberculosis in Swine

By ARTHUR J. KNILANS, Janesville, Wisconsin
Commissioner, National Live Stock Exchange

RESEARCH work that has been done by Van Es, Shalk, Graham and others for the past few years revealed that without question the major portion of the hogs retained by the inspectors in the slaughter houses on account of tuberculosis received their infection from flocks of poultry on the farm.

This information was brought out by a request from Prof. H. R. Smith of the National Live Stock Exchange for information as to the cause of so much tuberculosis in hogs in counties free from bovine tuberculosis.

Many interesting cases have been uncovered in checking some of the farms to secure information and the story of one farm will serve to show the amount of loss that can follow in the wake of a few old tuberculous hens.

As part of our program to interest the farmer, Dr. Larson, (then State Veterinarian) and the writer tested all the poultry flocks supplying eggs to the Hatcheires in one of the Central Wisconsin Counties. Infection found on these farms varied from none to all the birds reacting to the test (old birds).

On one farm 15% of the old birds reacted. This farmer and his farm is way above the average. The cattle herd is pure bred and has been accredited for seven years; he was a leader in securing the area test for his county and is a leader in use of all the modern farm practice offered by the college and extension forces.

However the hogs and chickens were in a common yard for the winter. A lot of 89 hogs were ready for market and as this looked like an ideal place to show the results of poultry or avian infection in hogs we followed the hogs to market.

Preparations were made by the Inspector in Charge to slaughter separately and secure the glands of the infected hogs for laboratory examination. It was expected that we might find a dozen hogs infected and by having this information we could use it back in the county where we were working.

When the results were tabulated 77 hogs were found infected with a loss of 44 heads and 37 visceras or a total of 81 parts. The loss was not confined to the parts sterilized or condemned about $40.00 worth of pork, but the extra time and labor amounted to almost as much.

On going back to the farm we tested eleven brood sows, dams of the pigs slaughtered, using both tuberculins with no reactions found. The pig litters then on the farm were tested with 25% of them showing reaction to the avian tuberculin only.

On checking the origin of the brood sows we found they were bred and fed to eight months of age on other farms on which the poultry flocks were free from tuberculosis.

The tattoo of hogs from accredited counties as now required by the packer will locate these infected farms and where the flock is worth the effort should result in increased testing of poultry flocks for the local veterinarian. Where the flock is not worth the effort it should be slaughtered and a new flock started.

The Live Stock Commissioners of the several markets have worked with the veterinarians in their territories to eradicate tuberculosis in cattle, hogs and poultry as well as to build up the veterinary profession. Let's hope the veterinary profession will give the same good help in the problem of poultry tuberculosis they have given in the problem of bovine tuberculosis. If they do it is only a matter of a few short years before the tuberculous hen will be literally a *rara avis*.

Stomatitis of Pigs

By A. T. KINSLEY, Kansas City, Missouri

STOMATITIS is very common and is directly or indirectly responsible for extensive losses of pigs, particularly on farms where swine have been maintained in the same lots for several years. This disease is usually more prevalent when there is excessive rains and consequent insanitary pens and surroundings than it is in drier seasons. It is also far more prevalent in pigs that are farrowed and maintained in insanitary pens and hog houses than it is in pigs that are farrowed and kept in clean quarters and sanitary surroundings. After the disease has once occurred in pigs on a given farm it is prone to recur in pigs farrowed on the same premises thereafter.

The actual losses incident to stomatitis is difficult to estimate because the majority of swine breeders rarely report or record the loss of a little pig, however, it is known that the losses from this malady on some farms in certain years has been 25% of all the pigs farrowed.

Cause

There are many types of stomatitis according to a pathologic classification, such as catarrhal, vesicular, phlegmonous, ulcerative and necrotic. According to the cause *B. coli* have all been incriminated. All these stomatitis may be classified as infective and non-infective.

Non-infective stomatitis is usually caused by some mild irritant, such as hot slop and is not serious. Infectious stomatitis is caused by some microbian agent but predisposing influences are important factors in the occurrence of this type of disease. Infectious stomatitis probably occurs most frequently in pigs of large litters because they are likely to be undernourished and are prone to injure each other while attempting to nurse. Injuries or abrasions on the lips or buccal structures, due to fighting, harsh foods, etc., provide an avenue of entrance for varoius infecting microbes.

A variety of bacteria have been isolated from the lesions of stomatitis any one of which may be capable of producing the disease. Thus, pyogenic micrococci, streptococci, *B. pyocyaneus, B. necrophorus* and organisms are practically universally distributed, but probably none of them are capable of invading tissues that have not been previously injured. It is probable also that the pathogenicity of any of the microbian agents mentioned will be increased by a sojourn in injured tissues and that the disease has a tendency to become more severe in each succeeding case. When one pig in a litter becomes infected the infecting microbian agents are transferred to the sow's teat and other pigs become infected.

Symptoms

Stomatitis, at least the fatal type of this disease, occurs in the first few days after farrowing. Rather extensive lesions have been observed in one-day-old pigs, indicating infection at the time or immediately after farrowing. It may occur in pigs up to three weeks of age but is not common in pigs ten days of age or older.

Infrequent attempts to nurse is one of the first symptoms noted. Affected pigs are listless, they have a tendency to remain quiet and are not active and playful as are healthy pigs. In a few hours or within a day or two there is marked depression, gauntness, and probably diarrhea. If an affected pig is caught and carefully examined lesions will be found that are responsible for the condition. Several or all the pigs in a litter usually become affected with this disease, although it may be confined to a single pig of a litter.

Lesions

The lesions of stomatitis vary according to the infecting agent. The lesions are primarily confined to the lips, snout and any portion of the buccal mucosa or tongue. The successive changes in the affected tissue or tissues are: congestion, inflammation, suppuration and in the more severe cases necrosis. Hemorrhage may occur as a sequel of congestion or necrosis.

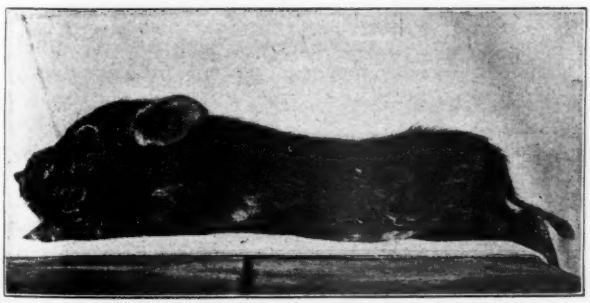
The lesions are usually quite superficial but in severe cases the submucosa or subcutis may be involved. In some cases pustules may be noted. Diffuse suppuration may occur in which case the pus is usually of a grayish white color. Some cases have been observed in which there was marked infiltration of the surrounding tissues thus producing a marked swelling. Stomatitis produced by the *B. pyocyaneus* is usually characterized by an intense destructive inflammation and the formation of a green-colored pus.

The lesion produced by the *B. necrophorus* is usually located at the margins of the gums. The successive changes in this lesion are as follows: congestion, tumefaction, increased sensitiveness. Two or three days later the affected area becomes yellowish white or even brown in color and of a mushy consistency, and later sloughs, leaving an eroded surface which is covered by coagulated necrotic debris that appears as a diphtheritic membrane. The surrounding tissue becomes red, tumefied and hypersensitive. These lesions extend and ultimately become confluent, forming large eroded areas. Similar lesions may occur on the lips, snout and cheeks.

Diagnosis

The diagnosis of stomatitis is not difficult provided the history, symptoms and lesions are given proper consideration. The different types may be identified thus: catarrhal stomatitis affects a large percentage of the exposed pigs simultaneously and practically the entire buccal mucosa will be affected.

Stomatitis produced by infection is characterized by local circumscribed or diffuse lesions. Pyogenic micrococci and the *B. pyocyaneus* stomatitis are typified by white patches on the buccal mucosa. *B. necrophorus* stomatitis is characterized by a rapid course and destructive inflammation involving local areas of the mucosa of the mouth. A pungent disagreeable odor emanates from these lesions.



Prevention

Stomatitis of pigs primarily occurs in pigs that are maintained in pens and lots that are not sanitary, in pigs that are improperly fed, and in pigs in large litters. The condition can be prevented by providing sanitary quarters, proper nourishing feed and seeing to it that a sow does not mother more pigs than she has teats. Pigs in excess of the number of teats should be artificially fed or placed with another sow that can provide for them.

It is not necessary to clip or remove so-called wolf teeth, black teeth or sharp teeth. In fact, clipping or extracting teeth in small pigs always produces more or less injury to the mucosa of the gums, thus providing an avenue of entrance for various microbes that are always present in the mouth and is a prolific cause of stomatitis.

Treatment

By proper care and treatment it is possible to reduce the loss of little pigs from stomatitis to a minimum provided the treatment is begun in the early stages of the disease. When stomatitis has been identified on a farm each pig particularly of the litters in which the disease has occurred should be caught and carefully examined at least once daily. Affected pigs should be treated once daily. A successful method of treatment consists of removing all necrotic tissue by means of a curette after which tincture of iodin is applied. One or two such treatments is sufficient and the large percentage that recover will probably surprise those who have not previously attempted to relieve these cases.

Swine Dysentery

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Department of Veterinary Science,
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SYNONYMS: Infectious colitis, infectious enteritis, mixed infection, necrotic enteritis, necro and bloody diarrhea.

Characterization: An infectious disease peculiar to swine. Chickens, guinea pigs, rabbits and rats are not susceptible. Swine of all ages are susceptible but pigs and feeding hogs are most commonly affected. The disease is characterized by a moderate fever, marked muco-hemorrhagic inflammation of the stomach and colon mucosa, followed by necrosis and desquamation. There is usually a profuse bloody diarrhea, considerable prostration and rapid emaciation.

History: The disease was first brought to the attention of veterinarians, in feeder hogs in the Central states in 1917. Its specific nature was established in 1918 by transmitting the disease to healthy hogs by feeding pieces of colons, colon contents, and feces and by pen exposure.

Geographical distribution: Sporadic outbreaks of the disease have been observed in Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Missouri, Nebraska, North Dakota and South Dakota. The majority of the outbreaks have originated in shipments of feeding hogs from stock yards. Later the disease spread to breeding hogs on the same or nearby farms.

Etiology and Infection: The nature of the causative organism is not known as the specific virus has not been isolated. The disease has been transmitted to healthy hogs by feeding sections of the stomach and colon, cecal and colon contents and feces from dysentery hogs, and also by pen exposure.

Natural infection occurs chiefly through eating feed contaminated with feces, although coprophagy evidently plays a part in dissemination.

The disease has not been produced by feeding systemic blood, hearts, lungs, liver, spleen, and kidneys of infected hogs. The feeding of pure cultures of *B. necrophorus* and *B. suipestifer* have failed to produce dysentery.

Microscopic examinations of properly stained sections of colon or smears of dysenteric stools from affected animals show the presence of enormous numbers of vibrios. These micro-organisms are so constantly present in such large numbers as to justify the suspicion that they are etiologically significant.

Symptoms: The period of incubation varies from five to 15 days. The early symptoms are moderate fever, slowness, diminished appetite, twitching of the tail, and a depressed appearance, standing with the head down or lying on the sternum—often dying in this position. The feces at first are soft but soon become a profuse watery diarrhea with mucus in the stools. The tomato-colored discharges soon appear and contain considerable blood, mucus and tissue shreds. Hogs that die in the early stages do not show much emaciation, while weakness and emaciation are marked in the later stages.

Morbid anatomy: Emaciation is common. The stomach and large intestines show about all that is abnormal. In the early cases there is marked gastritis, blood engorgement, and extravasates of the mucosa of the stomach, cecum, colon, and rectum. The small intestines are less frequently involved and to a less extent. The later and more advanced cases show varying degrees of diffuse necrosis of the mucosa of the stomach, cecum, colon and rectum. The necrotic mucosa varies from a grayish yellow to a reddish brown color. The necrosis frequently extends into the submucosa and muscular coats giving the so-called "cork-lined" appearance. There is a tendency to sloughing, leaving a granular surface. An exudate containing mucus and blood often

covers the necrotic surfaces. The colon content frequently has a "rice-water" appearance.

Microscopic sections reveal pronounced hyperemia and extravasations of blood in the early stages; while later stages show varying degrees of a catarrhal inflammation with a diphtheritic exudate.

Course and Mortality: The duration of the disease varies from a few days to a few weeks. Several hogs in good condition show indications of prostration and die during the early stages—first few days. Other hogs may recover in a few days and still others may linger for a few weeks. Many young hogs that recover remain stunted or unthrifty. Recovery in feeding hogs is usually complete in from three to six weeks. All hogs that fully recover are immune to subsequent exposures. The mortality varies from 40% to 60% in pigs and young hogs, from 10% to 25% in feeding hogs, and from 5% to 10% in breeding or heavy hogs. Some herds or shipments may show a 90% death rate.

Prognosis: The outcome depends upon local conditions and the age of the hogs. Usually the larger the hog the more favorable is the prognosis. Likewise with facilities for considerable range there is a greater opportunity of reducing the exposures and thus limiting the spread of the disease. In young hogs the prognosis is grave. It is frequently advisable for piggeries to discontinue breeding for at least one season. When large feeding or fat hogs are involved it is advisable to sell the healthy animals for immediate slaughter.

Differential diagnosis: Swine dysentery is to be differentiated from various dietary disorders and poisoning from soaps, alkalies, mineral mixtures, and worm expellers. Certain of the so-called mineral mixtures and worm expellers are known to be very irritating to the intestinal mucosa.

Swine dysentery is also to be differentiated from a rather common diseased condition of growing pigs known as "pig typhoid." This is characterized by emaciation, weakness, diarrhea and a catarrhal inflammation and some necrosis of both large and small intestines. This trouble is prevalent during May, June and July.

Many veterinarians consider pig typhoid as being due to various causes such as malnutrition, insanitary quarters, old yards, surface water, parasitism, and occasionally hog cholera. These cases seldom show any bloody diarrhea and the disease is not transmitted to other pigs by long pen exposure nor by feeding pieces of the colon wall or feces.

Swine dysentery is readily differentiated from hog cholera by the non-virulence of systemic blood, the absence of lesions outside of the abdominal viscera, the presence of diffuse necrosis in the colon and an absence of circumscribed button ulcers of the cecum and colon.

Treatment and prevention: There is no specific treatment. The use of mixed infection bacterins, vaccines, and tissue filtrates have not proved successful in preventing the disease. Therefore, the treatment is largely palliative. Sick hogs should either be destroyed or well isolated and the healthy hogs removed to a clean pasture where they have a wide range. Recovery in the sick hogs is facilitated by withholding all coarse feed such as corn and oats and giving light feedings of such feeds as shorts and buttermilk until the pigs again become very active and hungry.

All manure and litter should be burned and the quarters well cleaned and disinfected. Feeding floors and troughs should be carefully cleaned and disinfected after the development of each new case. When the herd is finally disposed of a thorough clean-up of the premises should be made, removing all accumulated manure to fields for cultivation. Thorough disinfection with a 3% water solution of the common disinfectants available, of all feeding and cleaning utensils, floors, and troughs. The disinfection may be repeated and the premises left idle for at least a month before new hogs are introduced. Purchase of hogs at public auctions, sales or from large public stock yards should be discouraged. If desirable or necessary such purchases should be held in quarantine for at least two weeks for close observation before being mixed with the native herd.

Virus Breaks

By C. M. McFARLAND, Kansas City, Missouri

THE use of the term "virus breaks" in a discussion of hog cholera, is of course, applicable only to the simultaneous treatment. Such a "break" or "post vaccination" sickness seldom occurs if a sufficient amount of properly prepared potent serum and virulent virus is administered to healthy pigs. There are, however, a number of conditions which will cause post vaccination sickness with no reflection upon the products used for prophylactic treatment.

There is always a reaction following the administration of virus and in some instances this may be so apparent as to cause the swine owner and veterinarian considerable worry. Lowered vitality in the pigs, too small a dose of serum or improper feeding may be instrumental in increasing the reaction. Slight sickness due to a reaction to the virus is not unusual, but conditions may exist which will "break" the immunity. Since immunity depends on both the virus and serum, it frequently becomes difficult to determine which product has had its action modified.

During the period of virus reaction the natural resistance of the pigs is lowered and this greatly increases their susceptibility to other infections which may cause serious trouble.

Any condition which will reduce the virulency of the virus will at the same time reduce the reaction and may therby shorten the period of immunity.

So called "virus breaks" generally occur in herds from thirty to sixty days, following vaccination. The loss of immunity after this short period is due to an attentuation of the virus.

Exposure to heat is the principal factor in the attenuation of virus. This may occur in shipping from the serum plant to the veterinarian. It may be kept in insufficiently cooled storage enroute, or it may be unduly exposed to heat after arrival at destination.

The addition of chemicals or an excess of phenol will attenuate virus, but this is of scientific interest only.

Age will reduce the virulency of virus, especially in combination with exposure to heat. Virus will maintain its virulency for months if kept under proper refrigeration.

The physical conditions of the pigs at time of treatment and subsequent thereto, is a very important matter. Infection by other diseases or improper housing or feeding may reduce the acquired resistance of the pigs to cholera, that is they may "break" the immunity. Excessive feeding of green corn, tankage, brine, salt and young cockle-bur shoots are the most common causes encountered. Long shipping has a debilitating effect on hogs and sometimes causes sickness.

Extensive worm (Ascaris) infestation, infection by hemorrhagic septicemia, or necrotic enteritis organisms, are very liable to reduce the acquired immunity against cholera to such a low ebb that in some instances the pigs may actually develop cholera and die from the disease. The use of the simultaneous treatment in pigs affected with necrotic enteritis generally causes a heavy death loss. These conditions may modify the action of the virus but in most instances are classified as "serum breaks."

Extreme dilutation of virus has been shown to render it non-infective. Pigs may have some tolerance for minute doses of virus and thus the antigenic reaction is not set up. The use of ⅛cc or ¼cc of virus in the field has been shown to be unsatisfactory.

In trying to administer such a small dose the syringe may not work and the pig not receive the virus, resulting in the abdomen. This form of the disease is

serum alone treatment, which of course, gives only a temporary passive immunity. Experience has taught that veterinarians using large doses of virus and serum secure the best results.

The importance of a correct diagnosis in suspected virus or serum breaks is not always sufficiently appreciated. In cases of sickness following the use of properly produced virus and serum in the correct dosage to healthy pigs, look for the cause of the trouble elsewhere as it is extremely seldom that the products are at fault. The blood of simultaneously treated pigs has been shown to be virulent for a period of two to three weeks. Lesions of hog cholera may be found in pigs for several weeks following the virus-serum treatment, even though they exhibit no symptoms of sickness.

The filterable virus of hog cholera produces very minute pin point hemorrhages difficult to discern, while the presence of large irregular petechiae and diffuse hemorrhages indicates infection from other micro-organisms.

The virus-serum treatment is specific for protection against hog cholera only, and any other condition or disease must be remedied or treated accordingly. Retreatment with serum and virus for any disease other than hog cholera is a needless waste of time and product and may result in a heavy death loss.

Swine Plague (Hemorrhagic Septicemia)

By A. T. KINSLEY, Kansas City, Missouri

SWINE plague is a specific infectious disease of swine. This disease is not so fatal as cholera but it is widespread and of great economic importance. It may occur sporadically or enzootically, but it rarely assumes an epizootic form. The percentage of losses in affected herds varies markedly, reaching as high as 75% in some instances. This disease is most common in shotes weighing 50 to 125 pounds, however, suckling pigs are frequently affected and aged brood sows have died of this malady. It is more prevalent some years than others. Apparently all breads of swine are equally susceptible.

Cause

Swine plague is a specific infection caused by the *B. bipolaris,* a short bipolar-staining, polymorphic, non-motile, non-spore-forming organism that grows readily on practically all culture media aerobically and anaerobically. This organism is easily destroyed by disinfectants. Small experimental animals are susceptible to the pathogenic action of these organisms and by the use of certain strains it is possible to fatally infect practically any of the larger animals. It is generally conceded that infection with the bipolar organism occurs most frequently when the resistance of the exposed animals have been reduced. Thus, swine plague is prone to occur in swine that are affected with hog cholera or necrotic enteritis and in those that are harboring parasites. It is more common in swine that have been subjected to the hardships of shipping, in pigs that have been recently weaned, and in swine that are improperly fed and housed, than in swine not debilitated by these or similar causes.

Symptoms

The period of incubation, at least in artificially infected cases, is of short duration, rarely exceeding two days. The septicemic type of the disease has a sudden onset and is characterized by a diminished appetite, weakness and a temperature of 105° F. to 106° F. There may be a blush or congestion of the skin, particularly on the venter surface of the

rapidly fatal, the duration rarely exceeding 12 hours.

The pulmonary form of the disease is the most common and is the type usually designated swine plague. Pulmonary swine plague is evidenced by a short dry spasmodic cough, dyspnea, temperature up to 105° F. mucous or muco-purulent nasal discharge, impaired appetite, usually constipation and a tendency for the affected animals to sit on their haunches. As the disease progresses, breathing becomes more difficult and extreme weakness and marked emaciation supervenes.

The usual course of the acute pulmonary type is about one week and the fatality is relatively high. In the prolonged subacute or chronic cases of pulmonary swine plague there is a persistent cough, emaciation and weakness, such cases may terminate fatally in four to six weeks. A varying percentage of swine affected with the pulmonary form of swine plague ultimately recover but they regain their lost flesh and vigor so slowly that they are usually a liability rather than an asset.

There may be an intestinal and cerebral form of hemorrhagic septicemia in swine but these forms and particularly the intestinal type, if there is such, is so admixed with other infections that they are difficult to identify as separate entities.

Lesions

The septicemic type of swine plague is manifested by petechial hemorrhages in the serous and mucous membranes and possibly also in the skin. The lymph nodes are usually tumefied and hemorrhagic. There may be hemorrhages in the kidneys and in other organs.

The pulmonary type of the disease is characterized by a typical catarrhal pneumonia.

Different areas of the lung show different stages of the disease, such as congestion, red hepatization, gray hepatization and resolution or necrosis. The different stages of progress of the disease results in a mottled or marbled appearance of the lung. In swine plague pneumonia the interlobular spaces are clearly outlined because of the excessive edematous infiltration. The bronchial and mediastinal lymph nodes are usually tumefied and hemorrhagic and in the chronic cases the nodes may contain necrotic areas. The pleura at least that lying adjacent to the involved area in the lung is usually affected with a fibrinous inflammation and there is usually adhesions of the visceral and parietal pleura.

Diagnosis

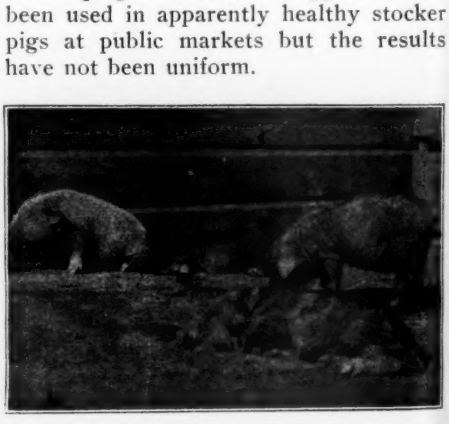
The septicemic type of porcine hemorrhagic septicemia is difficult to differentiate from hog cholera. A careful consideration of the history of the outbreak, symptoms and lesions will usually give the basis for a correct diagnosis, although in some instances the demonstration of the *B. bipolaris* of hemorrhagic septicemia or the filtrable virus of cholera is the only certain method of making a positive diagnosis.

The pulmonary type or swine plague is not difficult to diagnose if the post-mortem findings are properly interpreted.

Prevention and Treatment

Prevention by enforcement of sanitary regulations is of considerable value in the control of this disease. The spread of the pulmonary form of the disease is apparently favored by dry weather probably because of the irritating effects of dust.

This disease has been successfully controlled on farms by the administration of swine plague bacterin. Aggressin has been used in apparently healthy stocker pigs at public markets but the results have not been uniform.



Swine Obstetrics

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IN THE corn belt, dystocia or painful or difficult birth in swine, is relatively common and veterinarians are frequently consulted in regard to the handling of this trouble.

Causes of Dystocia

1. *Fall and Spring Farrowing.* Practical breeders of swine will many times ask why there is usually less trouble from dystocia in sows farrowing in the fall than those farrowing in the spring. Exact information is not obtainable, but the generally accepted opinion is probably correct that sows bred in the spring, to farrow in the fall, live under more natural conditions than those bred late in the fall to farrow early in the spring. The former have access to an abundance of green, succulent feed, they have more opportunities for exercise, and therefore taken as a whole they are in better physical condition. The latter, on the other hand, are fed under winter conditions on dry feed, sometimes of an improper character such as white corn, with limited exercise, none of them being conducive to normal farrowing.

2. *Large Boars and Young Gilts.* It is not uncommon, when a breeder has a valuable herd boar, to continue to use this animal as a sire for some time. The result is that the male is of a relatively large size as compared to the females served by him. After a normal period of gestation the pigs are unusually large and well developed, with the result that there is difficulty in their passage through the birth canal.

3. *Constricted Pelvic Girdle, or Abnormalities in or Near It.* Either as the result of improper nutrition or from hereditary causes, the pelvic girdle in the young female may be of an abnormally small size. On the other hand, it may be of normal proportions, though tumors, tylomas, and other abnormalities situated in or close to it reduce its relative size.

4. *Uterine Inertia.* This is a rather common cause of dystocia. It is difficult to point to the specific factor responsible for it. Undoubtedly reduced vitality from one cause or another must be held responsible. It is observed in winter-fed, pregnant sows, overly fat sows, sows that have not had sufficient exercise, or sows that are devitalized from improper food or due to diseased conditions. At the time of birth, then, everything appears to be normal excepting that the uterus is lacking in tone, and the expulsive efforts necessary are lacking.

5. *Decomposition Emphysema.* If birth is delayed for any considerable length of time, the fetus soon dies and decomposition sets in, with the result that the tissue spaces become filled with gas. This so enlarges the fetus, and, as it is almost always accompanied by dryness of the birth canal, delivery is quite effectually blocked.

Handling of Dystocia

A fundamental principle to bear in mind in the handling of dystocia is to resort to the simplest method that is likely to give efficient results.

1. *Anesthesia.* In those forms of dystocia that necessitate painful manipulations or extensive surgical interference for their relief, anesthesia should be resorted to.

a. *Spinal Anesthesia.* In young, thin sows spinal anesthesia is very satisfactory. In old or fat sows it is not satisfactory because of the closure in them of the lumbo-sacral space and because of the difficulty in accurately passing the needle to the desired point through a thick layer of fat.

An 18 gauge needle, three inches long, is passed with proper antiseptic precautions into the lumbo-sacral space. This space is located by drawing an imaginary line across the anterior borders of the wings of the ilium. About two and one-half inches posterior to this line, and exactly in the middle line of the body, the needle is inserted in a downward and

forward direction. When it reaches the spinal canal the animal will give evidence of pain. Depending upon the size of the animal, 5 cc to 15 cc of a 2% procain solution is injected and the animal's hind parts slightly elevated. Paralysis of the posterior extremities is evidence that the anesthesia is complete. The above described technic has been extensively used by Doctor Frank in our veterinary clinic, with excellent results.

b. *Chloral Anesthesia.* In old sows, where the veterinarian lacks professional assistance, satisfactory anesthesia may be induced by a rectal injection of a solution of chloral hydrate. We generally estimate that two drams of chloral hydrate dissolved in two ounces of water may be administered per rectum for each fifty pounds of the animal's weight. After anesthesia is complete we frequently introduce a long-nozzled syringe into the rectum to withdraw an excess of unabsorbed chloral hydrate solution.

c. *Chloroform Anesthesia.* As usually applied, this is also satisfactory when professional assistance is available.

2. *Medicaments.* Certain drugs are frequently of value and some are absolutely necessary in the handling of dystocia.

a. Antiseptics should be available, not only for cleansing the external genitalia, but also for use on the operator's hands and instruments.

b. Because of the fact that dryness of the genital passageway is a common cause of difficult birth, the obstetrician should always have available some good, non-irritating lubricant. Mineral oil, raw linseed oil, slippery elm bark, therapogen and similar agents are very valuable. Experience seems to indicate, however, that agents of this nature should be injected into the genital passageway in very limited quantities only, because an excess is inimical to the life of the fetus.

c. Because delayed birth is so frequently due to uterine inertia, the veterinarian should always be supplied during the farrowing season with drugs to overcome this condition.

Pituitary extract has found high favor in this connection. It should preferably be administered intravenously, though fairly good results follow the subcutaneous use. The dosage, depending upon the size of the animal, is from 2 cc to 4 cc. It usually stimulates the atonic uterus into prompt contractions.

d. Fluid extract of ergot and extract of ergot (ergotin). The oral administration to an averaged sized sow of from one-half to 1 dram of fluid extract of ergot repeated every thirty minutes will usually cause the desired uterine contractions. The doses must not be too large, because in that event spasm or continuous contraction of the uterus is likely to result, and the fetus would then be grasped in a viselike manner, rather than expelled by intermittent contractions. On the other hand, if it is desired to control post-partum hemorrhage, a single large dose is indicated.

Extract of ergot, usually spoken of as ergotin, may be administered in solution, either by the mouth or subcutaneously, in doses of 2 grains to 10 grains. Its action is somewhat prompter than that of the fluid extract.

3. *Instruments and Their Use.* Undoubtedly one of the best instruments in veterinary practice is a sharp pointed, acute angled, rigid obstetrical hook. This is far more efficient and takes the place of the piece of hooked wire so commonly resorted to. Properly lubricated, it may be passed into the uterus, easily hooked into some part of the fetus, so that the latter may be brought to the entrance of the pelvis, where forceps may be more readily applied to it and delivery effected.

Furthermore, one of the best aids in swine obstetrics is a small handed person. The average boy, raised under farm conditions, can effect delivery quicker than by almost any form of instrumentation.

4. *Laparotomy.* In those cases where the simpler methods fail, the animal should be properly anesthetized and laparotomy performed through the flank. The hand may

then be introduced into the abdominal cavity, the gravid uterus grasped, and in some cases, by proper manipulation, the fetus may be carefully forced in the direction of the external genitals, where delivery may be completed by the use of forceps.

5. *Laparohysterotomy (Caesarean Section)*. If laparotomy alone fails, the uterus itself must also be incised. This is done preferably along its dorsal surface because of an absence of blood vessels. The incision is made directly over the fetus so that the latter, with its membranes may be removed. Sometimes more than one fetus may be removed through a single opening, but usually a separate uterine incision is required for each fetus. The membranes are always simultaneously removed. The uterine incisions are closed by closely placed Lembert sutures of chromic catgut. The abdominal wound may be closed by braided silk or tape sutures passed through the skin and muscles. In our practice we have paid no attention to the peritoneal incision.

If a careful technic is observed, especially in regard to antiseptic precautions, shaving of the operative area, thorough disinfection of the skin, covering all of the animal excepting the operative area with a sterilized cloth, and the use of properly sterilized instruments and suturing material, maximum percentage of good results may be expected, especially in those cases where operative interference is practiced before extensive decomposition or degenerative changes have taken place in the operative region.

Serum Breaks

By WALTER J. LOPP, Kansas City, Kansas

ANTI-HOG cholera serum is the best, the most dependable, the most nearly perfect of all the biological products. Anti-small pox vaccination, for some reason not understood, on rare occasions fails to prevent small pox. Anti-typhoid vaccination does not always protect against mass infection. The tuberculin test notoriously fails in a certain small percentage of cases to which it is applied and yet no scientific man ever criticises these products for their rare failures, or even suggests a limitation in their uses because they are not 100 per cent perfect.

Anti-hog cholera serum, on the other hand, as made at present, will prove its merits under the most severe tests. That of its own accord it ever fails to give protection against the filtrable virus of hog cholera is exceedingly doubtful, and yet you continually see serum held up to question because of so called serum "breaks."

Let it be said in the beginning that a serum "break" consists in the developing of hog cholera in seven to 15 days after the administration of the serum-virus treatment, and further, that the great majority of cases that are called serum "breaks" are due to a failure to make a careful diagnosis of disease of hogs following the serum-virus treatment.

It must be remembered that a hog dying from any cause within several weeks following the serum-virus treatment will probably exhibit lesions of hog cholera. These are to be found in well hogs slaughtered for any purpose as well as in hogs that have died of disease. It by no means follows that the latter have died of cholera because dying of disease they exhibit cholera lesions following vaccination.

Hog cholera following the simultaneous treatment, may be due to any one of four factors: 1. The product used; 2. The user; 3. The hog; and 4. After care. Let us discuss these factors in order:

1. Under present conditions of manufacture by reliable firms, the production and marketing of an impotent serum or a serum of low potency is practically impossible.

2. Where the vaccination is done by a veterinarian—and it should never be done by laymen—the imperfections in the operation will consist almost solely in underesti-

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mating the weight of the hogs, and therefore, the use of an insufficient quantity of serum. Some veterinarians are not expert in estimating the weight of pigs. Some owners, in an endeavor to keep down the cost of vaccination, purposely understate the weight of the hogs and thus mislead the veterinarian. Mistakes of this kind are fewer now than in the past. With more experience in handling hogs and in swine practice, practically all veterinarians are now able to judge accurately the weight of the hogs and therefore the amount of serum that should be given.

3. The condition of the hog to be vaccinated is far more important than either of the preceding causes of unsatisfactory results following vaccination. The hogs should be healthy. If there is the slightest question on this matter, considering the widespread prevalence of enteritis, the animals should be prepared for from 12 to 15 days before vaccination by giving large doses of enteritis bacterin and the alkaline feed treatment, which consists in feeding on barley or mill feed slop, to which has been added sodium hydrate, copper sulphate, sodium bicarbonate and sodium hyposulphate, or better still, fed on oats soaked in water to which these ingredients have been added. Of course, if cholera is prevalent in the herd, or if there is imminent danger of the herd acquiring it, it may be better to disregard this preparation and take the consequences; but under ordinary conditions of vaccination no chances should be taken on the physical condition of animals vaccinated.

4. It should never be forgotten that in a properly vaccinated animal, there is a distinct reaction to the virus, and that during the period of this reaction the animal's resistance to all other infections and unfavorable conditions is markedly lowered. This is the reason for cleaning up any low form of enteritis that may be present but not observable. It is also a reason for protecting the animals for a period following vaccination from all manner of hardships and infection. Exposure to inclement weather, sudden changes of feed, long journeys on the railroad, filthy hog lots, dusty bedding, impure water, etc., are just so many things that may not particularly injure the well hog, but are extra hazardous for the vaccinated hog.

Feeding too, is important. New corn or any corn not thoroughly cured is notoriously difficult for a hog to digest and a frequent cause of loss in hogs. Particularly should it be avoided immediately following vaccination. In fact, full feeding on any corn, even the dryest old corn, is inimical to the best results following vaccination, although vaccinated pigs may receive a small quantity of old corn without harm.

There is another matter in feeding after vaccination that needs to receive attention. For some reason that has never been explained, tankage, commercial feeds, in fact all high protein feeds have a tendency to break down the immunity conferred by anti-cholera serum, and are to be carefully avoided immediately following vaccination.

Given a healthy hog, properly vaccinated with a serum and virus of any reliable manufacturer, and properly cared for afterward, there will be no serum "breaks." When a sickness does appear in animals from 7 to 15 or even 21 days after vaccination, it will be found in a great majority of cases, to be due to some infection other than the filtrable virus, and in such cases a revaccination is useless, since anti-hog cholera serum is protective against the virus disease only.

NOTICE: Because of lack of space, we are compelled to hold a number of articles written for this Special Swine Practice issue until next month. These articles include: "Hog Cholera with Special Reference to Differential Diagnosis" by A. Eichhorn; "Plants Poisonous to Swine" by L. H. Pammel; "Sterility an Important Breeding Problem" by A. T. Kinsley; "Polyarthritis of Swine" and "Baby Pig Immunization to Hog Cholera."